

Study Area: PG&E Greater Bay Area  
Thermal Overloads



| Overloaded Facility                            | Contingency (All and Worst P6)                                 | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions  |
|--|--|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|---|
|  |  |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |   |
| AMES-Mountain View 115 kV                      | MONTA VISTA 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 138                            | 138              | 152              | 72                   | 70                   | 90               | 104              | 97               | 142                               | 115                                   | 65                               | 153                                | 158                                       | Protection upgrade  |
| AMES-Whisman 115 kV                            | MONTA VISTA 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 144                            | 144              | 159              | 70                   | 67                   | 92               | 107              | 100              | 149                               | 116                                   | 61                               | 160                                | 165                                       | Protection upgrade  |
| Cayetano-Lone Tree (Lone Tree-USWP) 230kV Line | C.COSTAPPF 230kV - Section 2F & 1F                             | P2       | Bus-Tie-Breaker      | 93                             | 90               | 102              | 17                   | 10                   | 58               | 59               | 63               | 91                                | 53                                    | 20                               | 101                                | 97  | Continue to monitor future load forecast  |
|  | MORAGA 230kV - Section 2D & 1D                                 | P2       | Bus-Tie-Breaker      | 97                             | 97               | 112              | 29                   | 26                   | 64               | 68               | 70               | 101                               | 71                                    | 30                               | 113                                | 112                                       | Continue to monitor future load forecast  |
|  | NEWARK D 230kV Section 1D                                      | P2       | Bus                  | 85                             | 88               | 102              | 22                   | 22                   | 55               | 58               | 61               | 90                                | 60                                    | 24                               | 103                                | 106                                       | Continue to monitor future load forecast  |
|  | NEWARK D Section 1D & NEWARK E Section 1E 230kV                | P2       | Bus-Tie-Breaker      | 84                             | 93               | 106              | 20                   | 20                   | 53               | 57               | 68               | 95                                | 58                                    | 22                               | 107                                | 110                                       | Continue to monitor future load forecast  |
|  | RUSEL GEN UNITS & CONTRA COSTA-LAS POSITAS 230kV               | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 101                                       | Sensitivity only  |
|  | LAS POSITAS-NEWARK 230kV & PPASSJCT-NEWARK E #2 230kV          | P6       | N-1-1                | <100                           | <100             | 101              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 101                                       | Continue to monitor future load forecast  |
|  | Contra Costa-Moraga Nos. 1 & 2 230 kV lines                    | P7       | DCTL                 | <100                           | <100             | 106              | <100                 | <100                 | <100             | <100             | 68               | <100                              | <100                                  | <100                             | 106                                | 106                                       | Continue to monitor future load forecast  |
| Cayetano-Lone Tree (USWP-Cayetano) 230kV Line  | Tesla-Newark No.1 and Tesla-Ravenswood 230 kV lines            | P7       | DCTL                 | 88                             | 86               | 99               | 28                   | 29                   | 59               | 63               | 66               | 91                                | 66                                    | 29                               | 100                                | 102                                       | Sensitivity only  |
|  | C.COSTAPPF 230kV - Section 2F & 1F                             | P2       | Bus-Tie-Breaker      | 102                            | 99               | 102              | 27                   | 10                   | 60               | 61               | 64               | 100                               | 69                                    | 32                               | 101                                | 97  | Contra Costa 230 kV bus upgrade or Contra Costa area generation redispatch                                |
|  | MORAGA 230kV - Section 2D & 1D                                 | P2       | Bus-Tie-Breaker      | 106                            | 106              | 112              | 39                   | 26                   | 67               | 70               | 71               | 110                               | 86                                    | 42                               | 113                                | 111                                       | Moraga 230 kV bus upgrade or Contra Costa area generation redispatch                                      |
|  | NEWARK D 230kV Section 1D                                      | P2       | Bus                  | 94                             | 97               | 102              | 32                   | 22                   | 57               | 60               | 62               | 99                                | 76                                    | 36                               | 102                                | 106                                       | Continue to monitor future load forecast  |
|  | NEWARK D Section 1D & NEWARK E Section 1E 230kV                | P2       | Bus-Tie-Breaker      | 92                             | 101              | 106              | 31                   | 21                   | 56               | 59               | 69               | 104                               | 74                                    | 35                               | 107                                | 110                                       | Continue to monitor future load forecast  |
|  | LAS POSITAS-NEWARK 230kV & PPASSJCT-NEWARK E #2 230kV          | P6       | N-1-1                | <100                           | <100             | 101              | <100                 | <100                 | <100             | <100             | <100             | 103                               | <100                                  | <100                             | <100                               | 101                                       | Continue to monitor future load forecast  |
|  | Contra Costa-Moraga Nos. 1 & 2 230 kV lines                    | P7       | DCTL                 | <100                           | <100             | 106              | <100                 | <100                 | <100             | <100             | 69               | <100                              | <100                                  | <100                             | 106                                | 105                                       | Continue to monitor future load forecast  |
| Christie-Sobrante (Oleum-Sobrante) 115kV Line  | Tesla-Newark No.1 and Tesla-Ravenswood 230 kV lines            | P7       | DCTL                 | 97                             | 95               | 99               | 39                   | 29                   | 62               | 65               | 67               | 99                                | 81                                    | 41                               | 100                                | 102                                       | Sensitivity only  |
|  | SOBRANTE-G #1 115kV & SOBRANTE-G #2 115kV                      | P6       | N-1-1                | 101                            | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | <100                                      | Project: Christie - Sobrante 115 kV Line Reconductor<br>In-service date: 12/22<br>Short term: Action Plan |
| Contra Costa-Las Positas 230kV Line            | C.COSTAPPE 230kV - Section 2E & 1E                             | P2       | Bus-Tie-Breaker      | 104                            | 100              | 109              | 35                   | 18                   | 72               | 71               | 72               | 102                               | 86                                    | 38                               | 112                                | 100                                       | Contra Costa 230 kV bus upgrade or Contra Costa area generation redispatch                                |
| Eastshore 230/115kV Transformer #1             | E. SHORE 230kV - Middle Breaker Bay 3                          | P2       | Non-Bus-Tie Breaker  | 107                            | 108              | 113              | 9                    | 10                   | 102              | 104              | 114              | 109                               | 54                                    | 10                               | 111                                | 100                                       | Reconfigure E. Shore 230 kV bus connections   |
|  | EVRGRN 115kV Section 1D  | P2       | Bus                  | 60                             | 66               | 71               | 59                   | 65                   | 60               | 71               | 64               | 68                                | 63                                    | 57                               | 73                                 | 104                                       | Sensitivity only  |

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| Overloaded Facility                    | Contingency (All and Worst P6)  | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions |
|--|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|--|
|  |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |  |
| El Patio-San Jose Sta. 'A' 115 kV Line | MTCALF E 115kV - Section 1E & 2E                                      | P2       | Bus-Tie-Breaker      | 93                             | 102              | 111              | 73                   | 80                   | 84               | 106              | 95               | 106                               | 88                                    | 66                               | 113                                | 150                                       | Continue to monitor future load forecast               |
|  | MTCALF E 115kV Section 1X   | P2       | Non-Bus-Tie Breaker  | 59                             | 72               | 76               | 52                   | 57                   | 57               | 69               | 62               | 75                                | 59                                    | 49                               | 79                                 | 109                                       | Sensitivity only                                       |
|  | MTCALF E 115kV Section 1Y   | P2       | Non-Bus-Tie Breaker  | 60                             | 72               | 76               | 52                   | 57                   | 57               | 70               | 62               | 75                                | 59                                    | 49                               | 78                                 | 109                                       | Sensitivity only                                       |
|  | MTCALF E 115kV Section 2E   | P2       | Bus                  | 64                             | 70               | 77               | 54                   | 59                   | 61               | 74               | 67               | 73                                | 63                                    | 51                               | 79                                 | 106                                       | Sensitivity only                                       |
|  | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus                  | P2       | Bus-Tie-Breaker      | 68                             | 73               | 78               | 50                   | 55                   | 60               | 70               | 66               | 75                                | 65                                    | 49                               | 80                                 | 119                                       | Sensitivity only                                       |
|  | EVRGRN 115kV Section 1D   | P2       | Bus                  | 60                             | 66               | 71               | 59                   | 65                   | 60               | 71               | 64               | 67                                | 63                                    | 57                               | 73                                 | 104                                       | Sensitivity only                                       |
|  | DVR Gen Units (SVP) & SAN JOSE B-STONE- EVERGREEN 115kV               | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 104                                       | Sensitivity only                                       |
|  | LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)        | P5       | Non-Redundant Relay  | 72                             | 78               | 84               | 47                   | 52                   | 66               | 78               | 73               | 80                                | 69                                    | 45                               | 86                                 | 108                                       | Sensitivity only                                       |
|  | LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)       | P5       | Non-Redundant Relay  | 69                             | 74               | 82               | 56                   | 62                   | 59               | 70               | 66               | 77                                | 67                                    | 54                               | 84                                 | 119                                       | Sensitivity only                                       |
|  | LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)       | P5       | Non-Redundant Relay  | 74                             | 80               | 88               | 63                   | 69                   | 64               | 76               | 70               | 82                                | 71                                    | 61                               | 91                                 | 127                                       | Sensitivity only                                       |
|  | MONTA VISTA 115kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)        | P5       | Non-Redundant Relay  | 59                             | 64               | 72               | 49                   | 55                   | 58               | 68               | 62               | 66                                | 58                                    | 45                               | 74                                 | 101                                       | Sensitivity only                                       |
|  | PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 72                             | 78               | 85               | 46                   | 52                   | 66               | 79               | 74               | 81                                | 70                                    | 45                               | 86                                 | 112                                       | Sensitivity only                                       |
|  | NEWARK E-F BUS TIE 230kV & LOS ESTEROS-METCALF 230kV                  | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 131                                       | Sensitivity only                                       |
|  | Metcalf - Evergreen #1 and #2 115 kV Lines                            | P7       | DCTL                 | 85                             | 91               | 99               | 65                   | 71                   | 77               | 93               | 84               | 94                                | 82                                    | 61                               | 102                                | 135                                       | Sensitivity only                                       |
|  | Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines             | P7       | DCTL                 | 74                             | 80               | 88               | 63                   | 69                   | 64               | 76               | 70               | 82                                | 71                                    | 61                               | 91                                 | 127                                       | Sensitivity only                                       |
|  | Tesla - Newark No.2 and Metcalf - Los Esteros 230 kV lines            | P7       | DCTL                 | 60                             | 66               | 74               | 55                   | 60                   | 59               | 69               | 63               | 68                                | 61                                    | 51                               | 76                                 | 104                                       | Sensitivity only                                       |
| Evergreen-Almaden 60 kV Line           | MONTA VISTA-LOS GATOS 60kV  | P1       | N-1                  | 112                            | 111              | 124              | 68                   | 58                   | 88               | 104              | 96               | 117                               | 88                                    | 54                               | 124                                | 128                                       | Disable automatic load pickup                          |
| FMC-San Jose 'B' 115 kV Line           | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus                  | P2       | Bus-Tie-Breaker      | 80                             | 83               | 90               | 40                   | 48                   | 65               | 69               | 74               | 83                                | 77                                    | 45                               | 91                                 | 156                                       | Sensitivity only                                       |
|  | LOS ESTEROS-NORTECH 115kV & SSS-NRS 230kV (SVP)                       | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 108                                       | Sensitivity only                                       |
| Kifer-Duane 115 kV Line                | FMC-SAN JOSE B 115kV & NEWARK F-ZANKER-KRS 115kV                      | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 106                                       | Sensitivity only                                       |
|  | NRS 400 115 kV bus (SVP)  | P2       | Bus                  | 36                             | 42               | 45               | 33                   | 43                   | 44               | 43               | 46               | 41                                | 40                                    | 40                               | 47                                 | 104                                       | Sensitivity only                                       |

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| Overloaded Facility              | Contingency (All and Worst P6)                                 | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions                                   |
|----------------------------------|--|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|--|
|                                  |  |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |  |
| Kifer-FMC 115 kV Line            | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus           | P2       | Bus-Tie-Breaker      | 97                             | 102              | 109              | 44                   | 58                   | 87               | 90               | 98               | 102                               | 94                                    | 54                               | 112                                | 215                                       | SVP planned breaker upgrade project<br>In-service date: 12/20<br>Short term: Action plan |
|                                  | LOS ESTEROS-NORTECH 115kV & SSS-NRS 230kV (SVP)                | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 137                                       | Sensitivity only   |
| Las Positas-Newark 230kV Line    | C.COSTAPPE 230kV - Section 2E & 1E                             | P2       | Bus-Tie-Breaker      | 138                            | 132              | 146              | 37                   | 11                   | 59               | 57               | 60               | 133                               | 117                                   | 48                               | 150                                | 128                                       | Contra Costa 230 kV bus upgrade or Contra Costa area generation redispatch               |
|                                  | C.COSTAPPE Section 2E & C.COSTAPPF Section 2F 230kV            | P2       | Bus-Tie-Breaker      | 107                            | 107              | 114              | 25                   | 11                   | 48               | 50               | 52               | 108                               | 75                                    | 33                               | 114                                | 109                                       | Contra Costa 230 kV bus upgrade or Contra Costa area generation redispatch               |
|                                  | MORAGA 230kV - Section 2D & 1D                                 | P2       | Bus-Tie-Breaker      | 97                             | 100              | 107              | 32                   | 19                   | 45               | 48               | 49               | 101                               | 79                                    | 39                               | 108                                | 105                                       | Continue to monitor future load forecast   |
| Lawrence - Monta Vista 115 kV    | NEWARK F 115kV Section 2Z                                      | P2       | Bus                  | <100                           | 68               | 78               | <100                 | 40                   | <100             | 48               | 44               | 71                                | <100                                  | 39                               | 79                                 | 101                                       | Sensitivity only   |
| Llagas-CHSR 115 kV Line          | LLAGAS 115kV - Section 1F & 1E                                 | P2       | Bus-Tie-Breaker      | <100                           | 145              | 79               | <100                 | 99                   | <100             | 136              | 84               | 143                               | <100                                  | 3                                | 79                                 | 101                                       | Sensitivity only   |
| Llagas-Gilroy Foods 115 kV Line  | DVR Gen Units (SVP) & OLEUM-CHRISTIE-NRTH TWR 115kV            | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | <100                                      | Sensitivity only   |
|                                  | CONTRA COSTA-LAS POSITAS 230kV & OLEUM-CHRISTIE-NRTH TWR 115kV | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | <100                                      | Sensitivity only   |
| Los Esteros-Metcalf 230 kV Line  | NEWARK D Section 1D & NEWARK E Section 1E 230kV                | P2       | Bus-Tie-Breaker      | 70                             | 73               | 81               | 51                   | 54                   | 57               | 63               | 60               | 76                                | 62                                    | 49                               | 83                                 | 103                                       | Sensitivity only   |
|                                  | NEWARK E 230kV - Section 1E & 2E                               | P2       | Bus-Tie-Breaker      | 71                             | 74               | 81               | 49                   | 52                   | 57               | 63               | 59               | 76                                | 62                                    | 47                               | 83                                 | 104                                       | Sensitivity only   |
|                                  | NEWARK E-F BUS TIE 230kV & LECEF GEN UNITS                     | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 106                                       | Sensitivity only   |
| Los Esteros-Montague 115 kV Line | LOS ESTEROS-NORTECH 115kV & LOS ESTEROS-TRIMBLE 115kV          | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 108                                       | Sensitivity only   |
| Los Esteros-Nortech 115 kV Line  | SSS 230/230kV TB 1   | P1       | N-1                  | 85                             | 90               | 97               | 30                   | 34                   | 58               | 63               | 68               | 91                                | 74                                    | 34                               | 97                                 | 116                                       | Sensitivity only   |
|                                  | SSS-NRS 230kV (SVP)  | P1       | N-1                  | 86                             | 91               | 98               | 30                   | 33                   | 58               | 64               | 68               | 92                                | 75                                    | 34                               | 97                                 | 117                                       | Sensitivity only   |
|                                  | LS ESTRS 230kV - Middle Breaker Bay 8                          | P2       | Non-Bus-Tie Breaker  | 85                             | 90               | 97               | 30                   | 34                   | 58               | 63               | 68               | 91                                | 74                                    | 34                               | 97                                 | 116                                       | Sensitivity only   |
|                                  | NEWARK F 115kV - Section 2F & 1F                               | P2       | Bus-Tie-Breaker      | 55                             | 61               | 69               | 13                   | 15                   | 44               | 51               | 56               | 62                                | 62                                    | 17                               | 69                                 | 101                                       | Sensitivity only   |
|                                  | NRS 400 115 kV bus (SVP)                                       | P2       | Bus                  | 93                             | 99               | 107              | 31                   | 36                   | 61               | 68               | 73               | 100                               | 82                                    | 37                               | 107                                | 136                                       | SVP planned breaker upgrade project<br>In-service date: 12/20<br>Short term: Action plan |
|                                  | DVR Gen Units (SVP) & FMC-SAN JOSE B 115kV                     | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 107                                       | Sensitivity only   |
|                                  | FMC-SAN JOSE B 115kV & SSS-NRS 230kV (SVP)                     | P6       | N-1-1                | <100                           | 100              | 100              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 136                                       | Continue to monitor future load forecast   |
|                                  | Los Esteros - Trimble & Los Esteros - Montague 115 kV          | P7       | DCTL                 | 76                             | 81               | 89               | 23                   | 23                   | 57               | 65               | 68               | 83                                | 76                                    | 26                               | 88                                 | 102                                       | Sensitivity only   |
|                                  | Newark - Kifer & FMC - Kifer 115 kV Lines                      | P7       | DCTL                 | 51                             | 57               | 65               | 12                   | 18                   | 45               | 51               | 56               | 58                                | 59                                    | 17                               | 64                                 | 101                                       | Sensitivity only   |
|                                  | Newark - Northern #1 & #2 115 kV Lines                         | P7       | DCTL                 | 56                             | 63               | 70               | 12                   | 15                   | 44               | 52               | 57               | 64                                | 65                                    | 17                               | 70                                 | 106                                       | Sensitivity only   |
|                                  | Newark-Northern Nos. 1 & 2 115 kV lines                        | P7       | DCTL                 | 56                             | 63               | 70               | 12                   | 15                   | 44               | 52               | 57               | 64                                | 65                                    | 17                               | 70                                 | 106                                       | Sensitivity only   |

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| Overloaded Facility                               | Contingency (All and Worst P6)  | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions |
|---|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|--|
|   |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |  |
| Los Esteros-Silicon Switching Station 230 kV Line | LOS ESTEROS-NORTECH 115kV   | P1       | N-1                  | 93                             | 94               | 95               | 50                   | 51                   | 60               | 61               | 63               | 94                                | 61                                    | 51                               | 95                                 | 100                                       | Sensitivity only                                       |
|   | LS ESTRS 115kV - Middle Breaker Bay 1                                 | P2       | Non-Bus-Tie Breaker  | 93                             | 94               | 95               | 50                   | 51                   | 60               | 61               | 63               | 94                                | 61                                    | 51                               | 95                                 | 100                                       | Sensitivity only                                       |
|   | DVR Gen Units (SVP) & NORTECH-NORTHERN RECEIVING STATION 115kV        | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 103                                       | Sensitivity only                                       |
|   | LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)        | P5       | Non-Redundant Relay  | 97                             | 98               | 100              | 54                   | 54                   | 64               | 66               | 67               | 99                                | 68                                    | 55                               | 100                                | 108                                       | Continue to monitor future load forecast               |
|   | PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 99                             | 100              | 101              | 55                   | 55                   | 65               | 68               | 68               | 101                               | 69                                    | 56                               | 101                                | 110                                       | Continue to monitor future load forecast               |
|   | LOS ESTEROS-NORTECH 115kV & FMC-SAN JOSE B 115kV                      | P6       | N-1-1                | <100                           | <100             | 101              | <100                 | <100                 | <100             | <100             | <100             | 100                               | <100                                  | <100                             | 101                                | 113                                       | Continue to monitor future load forecast               |
| Metcalf 230/115 kV Trans No. 1                    | METCALF 230kV - Section 2D & 2E                                       | P2       | Bus-Tie-Breaker      | 94                             | 95               | 119              | 53                   | 56                   | 95               | 89               | 86               | 99                                | 95                                    | 58                               | 120                                | 125                                       | Continue to monitor future load forecast               |
|   | METCALF 230/115kV TB 4 & METCALF 230/115kV TB 2                       | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 103                                       | Sensitivity only                                       |
| Metcalf 230/115 kV Trans No. 2                    | METCALF 230kV - Section 1D & 1E                                       | P2       | Bus-Tie-Breaker      | 92                             | 92               | 110              | 50                   | 52                   | 91               | 85               | 83               | 96                                | 86                                    | 53                               | 111                                | 116                                       | Continue to monitor future load forecast               |
|   | METCALF 230/115kV TB 4 & METCALF 230/115kV TB 3                       | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 105                                       | Sensitivity only                                       |
| Metcalf 230/115 kV Trans No. 3                    | METCALF 230kV - Section 2D & 2E                                       | P2       | Bus-Tie-Breaker      | 94                             | 95               | 118              | 53                   | 56                   | 94               | 89               | 86               | 99                                | 95                                    | 58                               | 120                                | 125                                       | Continue to monitor future load forecast               |
|   | METCALF 230/115kV TB 4 & METCALF 230/115kV TB 2                       | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 103                                       | Sensitivity only                                       |
| Metcalf 230/115 kV Trans No. 4                    | METCALF 230kV - Section 1D & 1E                                       | P2       | Bus-Tie-Breaker      | 92                             | 92               | 111              | 50                   | 52                   | 92               | 85               | 83               | 96                                | 87                                    | 53                               | 112                                | 116                                       | Continue to monitor future load forecast               |
|   | METCALF 230/115kV TB 1 & METCALF 230/115kV TB 2                       | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 103                                       | Sensitivity only                                       |
| Metcalf 500/230 kV Trans No. 11                   | METCALF 500/230kV TB 13 & METCALF 500/230kV TB 12                     | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 108                                       | Sensitivity only                                       |
| Metcalf 500/230 kV Trans No. 12                   | METCALF 500/230kV TB 13 & METCALF 500/230kV TB 11                     | P6       | N-1-1                | <100                           | <100             | 102              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | 102                                | 110                                       | Continue to monitor future load forecast               |
| Metcalf 500/230 kV Trans No. 13                   | METCALF 500/230kV TB 12 & METCALF 500/230kV TB 11                     | P6       | N-1-1                | <100                           | <100             | 104              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | 104                                | 113                                       | Continue to monitor future load forecast               |
| Metcalf-El Patio No. 1 115 kV Line                | MTCALF D Section 2D & MTCALF E Section 2E 115kV                       | P2       | Bus-Tie-Breaker      | 76                             | 81               | 85               | 53                   | 58                   | 60               | 76               | 67               | 84                                | 71                                    | 47                               | 87                                 | 109                                       | Sensitivity only                                       |
|   | MTCALF E 115kV - Section 1E & 2E                                      | P2       | Bus-Tie-Breaker      | 77                             | 81               | 88               | 52                   | 56                   | 61               | 76               | 67               | 84                                | 72                                    | 46                               | 89                                 | 110                                       | Sensitivity only                                       |
|   | DVR Gen Units (SVP) & METCALF-EL PATIO #2 115kV                       | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 100                                       | Sensitivity only                                       |
|   | SSS-NRS 230kV (SVP) & METCALF-EL PATIO #2 115kV                       | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 105                                       | Sensitivity only                                       |
|   | Metcalf - Evergreen #1 and #2 115 kV Lines                            | P7       | DCTL                 | 72                             | 75               | 82               | 47                   | 51                   | 57               | 69               | 62               | 78                                | 68                                    | 43                               | 83                                 | 102                                       | Sensitivity only                                       |

Study Area: PG&E Greater Bay Area

Thermal Overloads



| Overloaded Facility                 | Contingency (All and Worst P6)                                      | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions |
|-------------------------------------|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|--|
|                                     |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |  |
| Metcalf-El Patio No. 2 115 kV Line  | MTCALF D - 1D 115kV & MTCALF D-LLAGAS line                          | P2       | Non-Bus-Tie Breaker  | 68                             | 80               | 83               | 46                   | 50                   | 56               | 68               | 61               | 82                                | 66                                    | 43                               | 85                                 | 106                                       | Sensitivity only                                       |
|                                     | MTCALF D - 1D 115kV & MTCALF D-ST TRESA line                        | P2       | Non-Bus-Tie Breaker  | 70                             | 81               | 85               | 48                   | 51                   | 58               | 69               | 62               | 84                                | 67                                    | 44                               | 86                                 | 108                                       | Sensitivity only                                       |
|                                     | MTCALF D 115kV Section 1D   | P2       | Bus                  | 68                             | 79               | 83               | 46                   | 50                   | 57               | 68               | 61               | 82                                | 66                                    | 43                               | 85                                 | 106                                       | Sensitivity only                                       |
|                                     | MTCALF D Section 1D & MTCALF E Section 1E 115kV                     | P2       | Bus-Tie-Breaker      | 88                             | 96               | 104              | 57                   | 62                   | 73               | 86               | 77               | 99                                | 83                                    | 54                               | 106                                | 127                                       | Continue to monitor future load forecast               |
|                                     | MTCALF E 115kV - Section 1E & 2E                                    | P2       | Bus-Tie-Breaker      | 77                             | 81               | 88               | 52                   | 56                   | 62               | 77               | 69               | 84                                | 72                                    | 46                               | 89                                 | 110                                       | Sensitivity only                                       |
|                                     | MTCALF D - 1D 115kV & MTCALF D-LLAGAS line                          | P2       | Non-Bus-Tie Breaker  | 68                             | 80               | 83               | 46                   | 50                   | 55               | 66               | 60               | 82                                | 66                                    | 43                               | 85                                 | 106                                       | Sensitivity only                                       |
|                                     | MTCALF D - 1D 115kV & MTCALF D-ST TRESA line                        | P2       | Non-Bus-Tie Breaker  | 70                             | 81               | 85               | 48                   | 51                   | 56               | 67               | 61               | 84                                | 67                                    | 44                               | 86                                 | 108                                       | Sensitivity only                                       |
|                                     | DVR Gen Units (SVP) & METCALF-EL PATIO #1 115kV                     | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 100                                       | Sensitivity only                                       |
|                                     | SSS-NRS 230kV (SVP) & METCALF-EL PATIO #1 115kV                     | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 105                                       | Sensitivity only                                       |
|                                     | Metcalf - Evergreen #1 and #2 115 kV Lines                          | P7       | DCTL                 | 72                             | 75               | 82               | 47                   | 51                   | 57               | 69               | 62               | 78                                | 68                                    | 43                               | 83                                 | 101                                       | Sensitivity only                                       |
| Metcalf-Evergreen No. 1 115 kV Line | EL PATIO-SAN JOSE A 115kV & EVRGRN 1-MTCALF E #2 115kV              | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 107                                       | Sensitivity only                                       |
| Metcalf-Evergreen No. 2 115 kV Line | MTCALF D Section 1D & MTCALF E Section 1E 115kV                     | P2       | Bus-Tie-Breaker      | <100                           | 81               | 91               | <100                 | 53                   | <100             | 77               | 70               | 84                                | <100                                  | 46                               | 92                                 | 108                                       | Sensitivity only                                       |
|                                     | EL PATIO-SAN JOSE A 115kV & METCALF-EVERGREEN #1 115kV              | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 108                                       | Sensitivity only                                       |
| Metcalf-Hicks 230 kV Line           | METCALF 230kV - Section 1D & 1E                                     | P2       | Bus-Tie-Breaker      | 85                             | 88               | 93               | 69                   | 73                   | 83               | 89               | 79               | 91                                | 79                                    | 68                               | 94                                 | 102                                       | Sensitivity only                                       |
|                                     | Metcalf-Monta Vista No. 3 & Monta Vista-Coyote Sw. Sta. 230 kV Line | P7       | DCTL                 | 85                             | 88               | 92               | 70                   | 75                   | 84               | 90               | 80               | 91                                | 78                                    | 70                               | 93                                 | 102                                       | Sensitivity only                                       |
| Monta Vista 230/115 kV Trans No. 2  | MONTAVIS 230/115kV TB 4 & MONTAVIS 230/115kV TB 3                   | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 106                                       | Sensitivity only                                       |
| Monta Vista 230/115 kV Trans No. 3  | MONTAVIS 230kV - Section 1D & 2D                                    | P2       | Bus-Tie-Breaker      | 78                             | 82               | 92               | 75                   | 79                   | 77               | 86               | 73               | 84                                | 72                                    | 73                               | 94                                 | 108                                       | Sensitivity only                                       |
|                                     | MONTAVIS 230/115kV TB 2 & MONTAVIS 230/115kV TB 4                   | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 102                                       | Sensitivity only                                       |
| Monta Vista 230/115 kV Trans No. 4  | MONTAVIS 230/115kV TB 2 & MONTAVIS 230/115kV TB 3                   | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 106                                       | Sensitivity only                                       |
| Monta Vista-Hicks 230 kV Line       | METCALF 230kV - Section 1D & 1E                                     | P2       | Bus-Tie-Breaker      | 85                             | 89               | 96               | 80                   | 88                   | 90               | 97               | 85               | 92                                | 84                                    | 82                               | 97                                 | 107                                       | Sensitivity only                                       |
|                                     | Metcalf-Monta Vista No. 3 & Monta Vista-Coyote Sw. Sta. 230 kV Line | P7       | DCTL                 | 85                             | 90               | 95               | 81                   | 91                   | 91               | 98               | 86               | 93                                | 83                                    | 85                               | 96                                 | 107                                       | Sensitivity only                                       |
| Monta Vista-Wolfe 115 kV Line       | STELLING-MONTA VISTA 115kV  | P1       | N-1                  | 98                             | 99               | 104              | 54                   | 53                   | 65               | 76               | 68               | 102                               | 86                                    | 49                               | 104                                | 104                                       | Continue to monitor future load forecast               |
|                                     | MNTA VSA 115kV - Middle Breaker Bay 2                               | P2       | Non-Bus-Tie Breaker  | <100                           | 98               | 104              | <100                 | 53                   | <100             | 76               | 68               | 101                               | <100                                  | 49                               | 104                                | 105                                       | Continue to monitor future load forecast               |





| Overloaded Facility            | Contingency (All and Worst P6)                          | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions  |
|--------------------------------|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|---|
|                                |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |   |
| Moraga-Claremont #1 115kV Line | CLARMNT - 2D 115kV & SOBRANTE-GRIZZLY-CLAREMONT #1 line | P2       | Non-Bus-Tie Breaker  | 109                            | 92               | 99               | 68                   | 55                   | 97               | 96               | 102              | 50                                | 73                                    | 51                               | 99                                 | 99  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads. |
|                                | CLARMNT - 2D 115kV & SOBRANTE-GRIZZLY-CLAREMONT #2 line | P2       | Non-Bus-Tie Breaker  | 109                            | 92               | 99               | 68                   | 55                   | 97               | 96               | 102              | 50                                | 73                                    | 51                               | 99                                 | 99  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads. |
|                                | CLARMNT 115kV Section 2D                                | P2       | Bus                  | 109                            | 92               | 99               | 68                   | 55                   | 97               | 96               | 102              | 50                                | 73                                    | 51                               | 99                                 | 99  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads. |
|                                | C-X #2 & #3 115kV                                       | P6       | N-1-1                | 103                            | 91               | 100              | 72                   | 54                   | 94               | 99               | 92               | 73                                | 82                                    | 45                               | 100                                | 100                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads. |
|                                | SOBRANTE 230kV - Section 2D & 1D                        | P2       | Bus-Tie-Breaker      | 101                            | 87               | 104              | 69                   | 60                   | 83               | 92               | 94               | 73                                | 82                                    | 45                               | 104                                | 104                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads. |
|                                | STATIN X 115kV - Section 2D & 1D                        | P2       | Bus-Tie-Breaker      | 113                            | NA               | NA               | 77                   | NA                   | 102              | NA               | NA               | 65                                | 79                                    | 54                               | NA                                 | NA  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads. |
| Moraga-Claremont #2 115kV Line | C-X #2 & #3 115kV                                       | P6       | N-1-1                | 103                            | 91               | 100              | 72                   | 55                   | 94               | 99               | 92               | 73                                | 82                                    | 45                               | 100                                | 100                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads. |
|                                | SOBRANTE 230kV - Section 2D & 1D                        | P2       | Bus-Tie-Breaker      | 102                            | 87               | 104              | 69                   | 60                   | 83               | 92               | 94               | 73                                | 82                                    | 45                               | 104                                | 104                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads. |
|                                | STATIN X 115kV - Section 2D & 1D                        | P2       | Bus-Tie-Breaker      | 113                            | NA               | NA               | 78                   | NA                   | 102              | NA               | NA               | 65                                | 79                                    | 54                               | NA                                 | NA  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads. |



| Overloaded Facility            | Contingency (All and Worst P6)  | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions  |
|--------------------------------|---------------------------------|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|---|
|                                |                                 |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |   |
| Moraga-Oakland X #1 115kV Line | CLARMNT 115kV - Section 2D & 1D | P2       | Bus-Tie-Breaker      | 106                            | 106              | 114              | 68                   | <100                 | 93               | <100             | <100             | 48                                | 70                                    | <100                             | 114                                | 114                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates overloads in 2024. For 2029, continue to monitor the future load forecast. |
|                                | K-D #1 & #2 115kV               | P6       | N-1-1                | 107                            | 106              | 114              | 67                   | <100                 | 93               | <100             | <100             | 47                                | <100                                  | <100                             | 114                                | 114                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates the identified overloads.  |
| Moraga-Oakland X #2 115kV Line | CLARMNT 115kV - Section 2D & 1D | P2       | Bus-Tie-Breaker      | 106                            | 106              | 114              | 68                   | <100                 | 93               | <100             | <100             | <100                              | <100                                  | <100                             | 114                                | 114                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates overloads in 2024. For 2029, continue to monitor the future load forecast. |
|                                | K-D #1 & #2 115kV               | P6       | N-1-1                | 107                            | 106              | 114              | 67                   | <100                 | 93               | <100             | <100             | 48                                | 70                                    | <100                             | 114                                | 114                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates the identified overloads.  |
|                                | MORAGA 115kV - Section 1D & 1E  | P2       | Bus-Tie-Breaker      | 103                            | NA               | NA               | 66                   | NA                   | 91               | NA               | NA               | 47                                | <100                                  | NA                               | NA                                 | NA  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates the identified overloads.  |
| Moraga-Oakland X #3 115kV Line | CLARMNT 115kV - Section 2D & 1D | P2       | Bus-Tie-Breaker      | 106                            | 106              | 114              | 68                   | <100                 | 93               | <100             | <100             | <100                              | <100                                  | <100                             | 114                                | 114                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates overloads in 2024. For 2029, continue to monitor the future load forecast. |
|                                | K-D #1 & #2 115kV               | P6       | N-1-1                | 107                            | 106              | 114              | 67                   | <100                 | 93               | <100             | <100             | 48                                | 70                                    | <100                             | 114                                | 114                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates the identified overloads.  |
|                                | MORAGA 115kV - Section 1D & 2D  | P2       | Bus-Tie-Breaker      | 119                            | NA               | NA               | 79                   | NA                   | 113              | NA               | NA               | 47                                | <100                                  | NA                               | NA                                 | NA  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates the identified overloads.  |



| Overloaded Facility               | Contingency (All and Worst P6)                               | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions  |
|-----------------------------------|--|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|---|
|                                   |  |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |   |
| Moraga-Oakland X #4 115kV Line    | CLARMNT 115kV - Section 2D & 1D                              | P2       | Bus-Tie-Breaker      | 106                            | 106              | 114              | 68                   | <100                 | 93               | <100             | <100             | <100                              | 105                                   | <100                             | 114                                | 114                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates overloads in 2024.<br>For 2029, continue to monitor the future load forecast. |
|                                   | K-D #1 & #2 115kV  | P6       | N-1-1                | 107                            | 106              | 114              | 67                   | <100                 | 93               | <100             | <100             | <100                              | <100                                  | <100                             | 114                                | 114                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads.   |
|                                   | MORAGA 115kV - Section 1D & 1E                               | P2       | Bus-Tie-Breaker      | 103                            | NA               | NA               | 66                   | NA                   | 91               | NA               | NA               | 48                                | 70                                    | NA                               | NA                                 | NA  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads.   |
|                                   | MORAGA 115kV - Section 1D & 2D                               | P2       | Bus-Tie-Breaker      | 119                            | NA               | NA               | 79                   | NA                   | 113              | NA               | NA               | 47                                | <100                                  | NA                               | NA                                 | NA  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads.   |
| Moraga-San Leandro #1 115kV Line  | MORAGA-SAN LEANDRO #2 115kV & MORAGA-SAN LEANDRO #3 115kV    | P6       | N-1-1                | 111                            | <100             | 113              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | 114                                | 116                                       | Project: East Shore - Oakland J 115 kV Reconductoring Project<br>Load increase in later years under review  |
| Moraga-San Leandro #2 115kV Line  | MORAGA 115kV - Section 1D & 1E                               | P2       | Bus-Tie-Breaker      | 114                            | NA               | NA               | 61                   | NA                   | 85               | NA               | NA               | NA                                | 96                                    | NA                               | NA                                 | NA  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads.   |
|                                   | MORAGA 115kV Section 1E                                      | P2       | Bus                  | 115                            | NA               | NA               | 62                   | NA                   | 87               | NA               | NA               | NA                                | 95                                    | NA                               | NA                                 | NA  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads.   |
|                                   | MORAGA-SAN LEANDRO #1 115kV & MORAGA-SAN LEANDRO #3 115kV    | P6       | N-1-1                | 111                            | <100             | 114              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | 115                                | 116                                       | Project: East Shore - Oakland J 115 kV Reconductoring Project<br>Load increase in later years under review  |
| Morgan Hill-Llagas 115 kV Line #2 | LLAGAS - 1F 115kV & MTCALF D-LLAGAS line                     | P2       | Non-Bus-Tie Breaker  | 115                            | 61               | 27               | 90                   | 47                   | 19               | 59               | 34               | 60                                | 43                                    | 5                                | 27                                 | 38  | Project: Metcalf - Morgan Hill - Watsonville Area Reinforcement<br>In-service date: 7/21<br>Short term: Action plan   |
|                                   | MORGAN HILL-LLAGAS 115kV_270 & OLEUM-CHRISTIE-NRTH TWR 115kV | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | <100                                      | Sensitivity only  |
| MOSSLNSW-LASAGUILASS #2 230KV     | TESLA-METCALF 500kV & MOSSLAND-LOSBANOS 500kV                | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 115                                       | Sensitivity only  |
|                                   | MTCALF E 115kV - Section 1E & 2E                             | P2       | Bus-Tie-Breaker      | 67                             | 73               | 82               | 75                   | 82                   | 68               | 75               | 63               | 76                                | 64                                    | 73                               | 84                                 | 101                                       | Sensitivity only  |





| Overloaded Facility                   | Contingency (All and Worst P6)                                 | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions  |
|---------------------------------------|--|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|---|
|                                       |  |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |   |
| Mountain View-Monta Vista 115 kV Line | DVR Gen Units (SVP) & WHISMAN-MTN VIEW 115kV                   | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 101                                       | Sensitivity only  |
|                                       | RAVENSWOOD 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 70                             | 73               | 84               | 69                   | 75                   | 68               | 72               | 66               | 77                                | 66                                    | 68                               | 86                                 | 102                                       | Sensitivity only  |
|                                       | NRS-SRS #1 115kV (SVP) & WHISMAN-MTN VIEW 115kV                | P6       | N-1-1                | <100                           | <100             | 100              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | 100                                | 112                                       | Continue to monitor future load forecast  |
|                                       | Britton-Monta Vista & Lawrence-Monta Vista 115 kV Lines        | P7       | DCTL                 | 67                             | 73               | 82               | 80                   | 87                   | 68               | 74               | 62               | 76                                | 66                                    | 80                               | 84                                 | 102                                       | Sensitivity only  |
|                                       | Monta Vista-Jefferson 230 kV Lines No. 1 & 2                   | P7       | DCTL                 | 71                             | 76               | 84               | 80                   | 91                   | 75               | 80               | 69               | 79                                | 69                                    | 83                               | 87                                 | 101                                       | Sensitivity only  |
|                                       | Monta Vista-Jefferson Nos. 1 & 2 230 kV lines                  | P7       | DCTL                 | 71                             | 76               | 84               | 79                   | 91                   | 75               | 80               | 69               | 79                                | 69                                    | 83                               | 87                                 | 101                                       | Sensitivity only  |
|                                       | Newark-Ravenswood 230 kV and Tesla-Ravenswood 230 kV lines     | P7       | DCTL                 | 73                             | 77               | 85               | 81                   | 89                   | 73               | 78               | 68               | 80                                | 74                                    | 81                               | 88                                 | 102                                       | Sensitivity only  |
| Newark 230/115kV Transformer #11      | NEWARK D Section 1D & NEWARK E Section 1E 230kV                | P2       | Bus-Tie-Breaker      | 106                            | 117              | 122              | 39                   | 29                   | 70               | 73               | 97               | 121                               | 93                                    | 38                               | 121                                | 134                                       | Newark 230 kV bus upgrade   |
|                                       | NEWARK E 230kV Section 1E                                      | P2       | Bus                  | 77                             | 98               | 104              | 29                   | 25                   | 51               | 55               | 60               | 100                               | 69                                    | 31                               | 102                                | 114                                       | Newark 230 kV bus upgrade   |
|                                       | NEWARK D 230/115kV TB 7 & NEWARK E-F BUS TIE 230kV             | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 103                                       | Sensitivity only  |
| Newark-Applied Materials 115kV Line   | NEWARK F-LAWRENCE-LOCKHD 1 115kV & BRITTON-MONTA VISTA 115kV   | P6       | N-1-1                | <100                           | 101              | 102              | <100                 | <100                 | <100             | <100             | <100             | 104                               | <100                                  | <100                             | 102                                | 105                                       | Continue to monitor future load forecast  |
| Newark-Dixon Landing 115kV Line       | PIERCY-METCALF 115kV   | P1       | N-1                  | 107                            | 74               | 82               | 47                   | 29                   | 73               | 63               | 57               | 77                                | 82                                    | 25                               | 82                                 | 84  | Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade<br>In-service date: 4/22<br>Short term: Action plan |
|                                       | MTCALF D Section 2D & MTCALF E Section 2E 115kV                | P2       | Bus-Tie-Breaker      | 107                            | 74               | 82               | 47                   | 29                   | 73               | 63               | 57               | 77                                | 82                                    | 25                               | 82                                 | 84  | Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade<br>In-service date: 4/22<br>Short term: Action plan |
|                                       | MTCALF E 115kV - Section 1E & 2E                               | P2       | Bus-Tie-Breaker      | 108                            | 74               | 83               | 47                   | 29                   | 73               | 63               | 58               | 78                                | 83                                    | 25                               | 84                                 | 86  | Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade<br>In-service date: 4/22<br>Short term: Action plan |
|                                       | MTCALF E 115kV Section 2E                                      | P2       | Bus                  | 107                            | 74               | 82               | 47                   | 29                   | 73               | 63               | 57               | 77                                | 82                                    | 25                               | 82                                 | 84  | Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade<br>In-service date: 4/22<br>Short term: Action plan |
|                                       | MTCALF E 115kV Section 2X                                      | P2       | Non-Bus-Tie Breaker  | 107                            | 74               | 82               | 47                   | 29                   | 73               | 63               | 57               | 77                                | 82                                    | 25                               | 82                                 | 84  | Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade<br>In-service date: 4/22<br>Short term: Action plan |
|                                       | MTCALF E 115kV Section 2Y                                      | P2       | Non-Bus-Tie Breaker  | 107                            | 74               | 82               | 47                   | 29                   | 73               | 63               | 57               | 77                                | 82                                    | 25                               | 82                                 | 84  | Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade<br>In-service date: 4/22<br>Short term: Action plan |

Study Area: PG&E Greater Bay Area

Thermal Overloads



| Overloaded Facility              | Contingency (All and Worst P6)  | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions  |
|----------------------------------|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|---|
|                                  |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |   |
|                                  | Swift - Metcalf & Piercy - Metcalf 115 kV Lines                               | P7       | DCTL                 | 108                            | 74               | 83               | 47                   | 29                   | 73               | 63               | 57               | 77                                | 82                                    | 25                               | 83                                 | 85  | Project: Metcalf - Piercy & Swift and Newark - Dixon Landing 115 kV Upgrade<br>In-service date: 4/22<br>Short term: Action plan |
| Newark-Kifer 115kV Line          | NEWARK E-F BUS TIE 230kV  | P1       | N-1                  | 45                             | 48               | 51               | 7                    | 12                   | 22               | 29               | 35               | 48                                | 49                                    | 16                               | 50                                 | 103                                       | Sensitivity only  |
|                                  | SSS 230/230kV TB 1  | P1       | N-1                  | 48                             | 52               | 56               | 14                   | 21                   | 29               | 35               | 38               | 53                                | 49                                    | 22                               | 54                                 | 102                                       | Sensitivity only  |
|                                  | SSS-NRS 230kV (SVP)   | P1       | N-1                  | 49                             | 53               | 57               | 15                   | 21                   | 29               | 35               | 39               | 53                                | 50                                    | 23                               | 55                                 | 103                                       | Sensitivity only  |
|                                  | NRS 400 115 kV bus (SVP)  | P2       | Bus                  | 69                             | 73               | 78               | 20                   | 28                   | 40               | 48               | 53               | 73                                | 68                                    | 30                               | 81                                 | 134                                       | Sensitivity only  |
|                                  | Internal breaker fault at Duane Duane-SRS 115 kV and KRS-Duane 115 kV and DVR | P2       | Non-Bus-Tie Breaker  | 59                             | 57               | 62               | 17                   | 19                   | 37               | 40               | 45               | 58                                | 61                                    | 22                               | 60                                 | 101                                       | Sensitivity only  |
|                                  | LS ESTRS 230kV - Middle Breaker Bay 8   | P2       | Non-Bus-Tie Breaker  | 48                             | 52               | 56               | 14                   | 21                   | 29               | 35               | 38               | 53                                | 49                                    | 22                               | 54                                 | 102                                       | Sensitivity only  |
|                                  | NEWARK E 230kV Section 1E   | P2       | Bus                  | 44                             | 48               | 52               | 7                    | 12                   | 22               | 29               | 35               | 49                                | 49                                    | 16                               | 51                                 | 104                                       | Sensitivity only  |
|                                  | NRS 400 115 kV bus (SVP)  | P2       | Bus                  | 70                             | 75               | 80               | 21                   | 29                   | 42               | 50               | 55               | 75                                | 70                                    | 31                               | 79                                 | 145                                       | Sensitivity only  |
|                                  | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus                          | P2       | Bus-Tie-Breaker      | 123                            | 126              | 136              | 32                   | 41                   | 76               | 86               | 96               | 127                               | 117                                   | 44                               | 135                                | 249                                       | SVP planned breaker upgrade project<br>In-service date: 12/20<br>Short term: Action plan  |
|                                  | DVR Gen Units (SVP) & LOS ESTEROS-NORTECH 115kV                               | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 117                                       | Sensitivity only  |
|                                  | LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)                | P5       | Non-Redundant Relay  | 45                             | 50               | 57               | 3                    | 11                   | 31               | 39               | 44               | 51                                | 52                                    | 12                               | 56                                 | 106                                       | Sensitivity only  |
|                                  | LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)               | P5       | Non-Redundant Relay  | 68                             | 72               | 77               | 27                   | 34                   | 39               | 47               | 51               | 73                                | 69                                    | 36                               | 76                                 | 136                                       | Sensitivity only  |
|                                  | LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)               | P5       | Non-Redundant Relay  | 62                             | 66               | 72               | 24                   | 31                   | 35               | 43               | 47               | 67                                | 66                                    | 34                               | 71                                 | 137                                       | Sensitivity only  |
|                                  | PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY)         | P5       | Non-Redundant Relay  | 52                             | 57               | 65               | 6                    | 13                   | 35               | 44               | 48               | 58                                | 58                                    | 14                               | 63                                 | 114                                       | Sensitivity only  |
|                                  | SSS-NRS 230kV (SVP) & LOS ESTEROS-NORTECH 115kV                               | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 149                                       | Sensitivity only  |
|                                  | Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines                     | P7       | DCTL                 | 62                             | 66               | 72               | 24                   | 31                   | 35               | 43               | 47               | 67                                | 66                                    | 34                               | 71                                 | 137                                       | Sensitivity only  |
|                                  | Newark - Northern #1 & #2 115 kV Lines  | P7       | DCTL                 | 38                             | 45               | 48               | 6                    | 12                   | 23               | 33               | 37               | 45                                | 53                                    | 14                               | 47                                 | 119                                       | Sensitivity only  |
|                                  | Newark-Northern Nos. 1 & 2 115 kV lines                                       | P7       | DCTL                 | 38                             | 45               | 48               | 6                    | 12                   | 23               | 33               | 37               | 45                                | 53                                    | 14                               | 47                                 | 119                                       | Sensitivity only  |
|                                  | NRS - Scott #1 and #2 115 kV Lines  | P7       | DCTL                 | 73                             | 73               | 78               | 14                   | 20                   | 45               | 50               | 56               | 73                                | 74                                    | 23                               | 77                                 | 139                                       | Sensitivity only  |
| Newark-Milpitas #2 115kV Line    | SWIFT-METCALF 115kV & NEWARK-MILPITAS #1 115kV                                | P6       | N-1-1                | <100                           | <100             | 102              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | 103                                | 105                                       | Continue to monitor future load forecast  |
| Newark-Newark Dist 230kV section | MOSSLAND-LOSBANOS 500kV & TESLA-METCALF 500kV                                 | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 104                                       | Sensitivity only  |
|                                  | NEWARK E-F BUS TIE 230kV  | P1       | N-1                  | 56                             | 59               | 59               | 8                    | 12                   | 25               | 34               | 42               | 60                                | 61                                    | 20                               | 60                                 | 107                                       | Sensitivity only  |



| Overloaded Facility                             | Contingency (All and Worst P6)  | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions                                   |
|---|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|--|
|   |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |  |
| Newark-Northern Receiving Station #1 115kV Line | SSS 230/230kV TB 1  | P1       | N-1                  | 60                             | 64               | 65               | 18                   | 24                   | 33               | 41               | 46               | 64                                | 58                                    | 28                               | 65                                 | 104                                       | Sensitivity only   |
|   | SSS-NRS 230kV (SVP)   | P1       | N-1                  | 60                             | 65               | 66               | 18                   | 24                   | 33               | 42               | 46               | 65                                | 59                                    | 29                               | 66                                 | 106                                       | Sensitivity only   |
|   | LS ESTRS 230kV - Middle Breaker Bay 8                                 | P2       | Non-Bus-Tie Breaker  | 60                             | 64               | 65               | 18                   | 24                   | 33               | 41               | 46               | 64                                | 58                                    | 28                               | 65                                 | 104                                       | Sensitivity only   |
|   | NEWARK E 230kV - Section 1E & 2E                                      | P2       | Bus-Tie-Breaker      | 57                             | 60               | 61               | 9                    | 13                   | 25               | 35               | 43               | 61                                | 63                                    | 22                               | 62                                 | 108                                       | Sensitivity only   |
|   | NEWARK E 230kV Section 1E   | P2       | Bus                  | 56                             | 55               | 54               | 8                    | 12                   | 24               | 34               | 42               | 55                                | 61                                    | 20                               | 55                                 | 102                                       | Sensitivity only   |
|   | NEWARK F 115kV - Section 2F & 1F                                      | P2       | Bus-Tie-Breaker      | 45                             | 51               | 55               | 8                    | 10                   | 21               | 35               | 41               | 52                                | 61                                    | 15                               | 57                                 | 123                                       | Sensitivity only   |
|   | NEWARK F 115kV Section 2Z   | P2       | Bus                  | <100                           | 61               | 64               | <100                 | 13                   | <100             | 41               | 47               | 61                                | <100                                  | 18                               | 65                                 | 114                                       | Sensitivity only   |
|   | DVR Gen Units (SVP) & LOS ESTEROS-NORTECH 115kV                       | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 121                                       | Sensitivity only   |
|   | LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)        | P5       | Non-Redundant Relay  | 55                             | 62               | 67               | 2                    | 9                    | 37               | 49               | 56               | 63                                | 64                                    | 14                               | 67                                 | 109                                       | Sensitivity only   |
|   | LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)       | P5       | Non-Redundant Relay  | 90                             | 94               | 97               | 36                   | 43                   | 49               | 61               | 65               | 95                                | 89                                    | 48                               | 98                                 | 155                                       | Sensitivity only   |
|   | LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)       | P5       | Non-Redundant Relay  | 81                             | 84               | 88               | 32                   | 38                   | 42               | 54               | 59               | 86                                | 84                                    | 44                               | 90                                 | 153                                       | Sensitivity only   |
|   | PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 66                             | 72               | 77               | 6                    | 13                   | 42               | 56               | 60               | 73                                | 73                                    | 17                               | 78                                 | 121                                       | Sensitivity only   |
|   | SSS-NRS 230kV (SVP) & LOS ESTEROS-NORTECH 115kV                       | P6       | N-1-1                | <100                           | 102              | 108              | <100                 | <100                 | <100             | <100             | <100             | 104                               | <100                                  | <100                             | 108                                | 173                                       | Continue to monitor future load forecast   |
|   | Newark - Kifer & FMC - Kifer 115 kV Lines                             | P7       | DCTL                 | 33                             | 39               | 40               | 7                    | 13                   | 22               | 31               | 36               | 39                                | 48                                    | 17                               | 40                                 | 101                                       | Sensitivity only   |
|   | Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines             | P7       | DCTL                 | 81                             | 84               | 88               | 32                   | 38                   | 42               | 54               | 59               | 86                                | 84                                    | 44                               | 90                                 | 153                                       | Sensitivity only   |
|   | SSS-NRS 230kV (SVP)   | P1       | N-1                  | 46                             | 51               | 55               | 17                   | 24                   | 27               | 34               | 37               | 51                                | 48                                    | 26                               | 56                                 | 101                                       | Sensitivity only   |
|   | NRS 300 115 kV bus (SVP)  | P2       | Bus                  | 50                             | 61               | 67               | 16                   | 28                   | 37               | 49               | 55               | 62                                | 54                                    | 28                               | 67                                 | 112                                       | Sensitivity only   |
|   | NRS 400 115 kV bus (SVP)  | P2       | Bus                  | 57                             | 64               | 69               | 20                   | 29                   | 32               | 42               | 46               | 64                                | 59                                    | 32                               | 70                                 | 131                                       | Sensitivity only   |
|   | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus                  | P2       | Bus-Tie-Breaker      | 90                             | 109              | 117              | 31                   | 46                   | 61               | 78               | 87               | 109                               | 87                                    | 48                               | 118                                | 205                                       | SVP planned breaker upgrade project<br>In-service date: 12/20<br>Short term: Action plan |
|   | DVR Gen Units (SVP) & SSS 230/230kV TB 1                              | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 116                                       | Sensitivity only   |

Study Area: PG&E Greater Bay Area  
Thermal Overloads



| Overloaded Facility                             | Contingency (All and Worst P6)  | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions               |
|---|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|--|
|   |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |  |
| Newark-Northern Receiving Station #2 115kV Line | LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY)       | P5       | Non-Redundant Relay  | 72                             | 77               | 83               | 32                   | 41                   | 41               | 51               | 54               | 78                                | 75                                    | 43                               | 85                                 | 146                                       | Sensitivity only   |
|   | LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)       | P5       | Non-Redundant Relay  | 62                             | 68               | 75               | 30                   | 38                   | 34               | 45               | 49               | 69                                | 71                                    | 41                               | 77                                 | 145                                       | Sensitivity only   |
|   | PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 47                             | 54               | 62               | 3                    | 12                   | 33               | 44               | 48               | 55                                | 57                                    | 12                               | 64                                 | 112                                       | Sensitivity only   |
|   | SSS-NRS 230kV (SVP) & LOS ESTEROS-NORTECH 115kV                       | P6       | N-1-1                | <100                           | <100             | 106              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | 106                                | 168                                       | Continue to monitor future load forecast                             |
|   | Newark - Kifer & FMC - Kifer 115 kV Lines                             | P7       | DCTL                 | 23                             | 29               | 32               | 11                   | 14                   | 18               | 26               | 29               | 29                                | 40                                    | 16                               | 33                                 | 103                                       | Sensitivity only   |
|   | Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines             | P7       | DCTL                 | 62                             | 68               | 75               | 30                   | 38                   | 34               | 45               | 49               | 69                                | 71                                    | 41                               | 77                                 | 145                                       | Sensitivity only   |
| Newark-Trimble 115kV Line                       | LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)       | P5       | Non-Redundant Relay  | 59                             | 59               | 63               | 37                   | 38                   | 22               | 29               | 28               | 61                                | 53                                    | 42                               | 65                                 | 100                                       | Sensitivity only   |
|   | LOS ESTEROS-METCALF 230kV & NEWARK E-F BUS TIE 230kV                  | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 101                                       | Sensitivity only   |
|   | Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines             | P7       | DCTL                 | 59                             | 59               | 63               | 37                   | 38                   | 22               | 29               | 28               | 61                                | 53                                    | 42                               | 65                                 | 100                                       | Sensitivity only   |
| Nortech-NRS 115 kV Line                         | SSS 230/230kV TB 1  | P1       | N-1                  | 76                             | 80               | 85               | 26                   | 29                   | 61               | 65               | 71               | 80                                | 66                                    | 30                               | 84                                 | 104                                       | Sensitivity only   |
|   | SSS-NRS 230kV (SVP)   | P1       | N-1                  | 77                             | 80               | 85               | 25                   | 28                   | 61               | 65               | 71               | 81                                | 67                                    | 29                               | 85                                 | 105                                       | Sensitivity only   |
|   | LS ESTRS 230kV - Middle Breaker Bay 8                                 | P2       | Non-Bus-Tie Breaker  | 76                             | 80               | 85               | 26                   | 29                   | 61               | 65               | 71               | 80                                | 66                                    | 30                               | 84                                 | 104                                       | Sensitivity only   |
|   | NRS 400 115 kV bus (SVP)  | P2       | Bus                  | 84                             | 89               | 95               | 26                   | 30                   | 64               | 71               | 77               | 90                                | 75                                    | 32                               | 94                                 | 125                                       | Sensitivity only   |
|   | SSS-NRS 230kV (SVP) & FMC-SAN JOSE B 115kV                            | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 124                                       | Sensitivity only   |
| North Dublin-Cayetano 230kV Cable               | MORAGA 230kV - Section 2D & 1D  | P2       | Bus-Tie-Breaker      | 101                            | 101              | 106              | 39                   | 26                   | 72               | 75               | 77               | 105                               | 84                                    | 42                               | 107                                | 105                                       | Moraga 230 kV bus upgrade or Contra Costa area generation redispatch |
|   | NEWARK D Section 1D & NEWARK E Section 1E 230kV                       | P2       | Bus-Tie-Breaker      | 87                             | 96               | 100              | 32                   | 23                   | 60               | 63               | 74               | 98                                | 72                                    | 36                               | 101                                | 103                                       | Continue to monitor future load forecast                             |
|   | Contra Costa-Moraga Nos. 1 & 2 230 kV lines                           | P7       | DCTL                 | <100                           | <100             | 100              | <100                 | <100                 | <100             | <100             | 74               | <100                              | <100                                  | <100                             | 101                                | 99  | Continue to monitor future load forecast                             |
| NRS 230/115kV TB 1                              | DVR Gen Units (SVP) & LOS ESTEROS-NORTECH 115kV                       | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 102                                       | Sensitivity only   |
|   | LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)        | P5       | Non-Redundant Relay  | 96                             | 97               | 98               | 54                   | 55                   | 64               | 66               | 67               | 97                                | 68                                    | 55                               | 97                                 | 104                                       | Sensitivity only   |
|   | PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 98                             | 99               | 99               | 55                   | 55                   | 65               | 68               | 68               | 99                                | 69                                    | 56                               | 99                                 | 105                                       | Sensitivity only   |
|   | LOS ESTEROS-NORTECH 115kV & FMC-SAN JOSE B 115kV                      | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 108                                       | Sensitivity only   |
|   | NRS-SRS #2 115kV (SVP)  | P1       | N-1                  | 85                             | 83               | 87               | 24                   | 25                   | 53               | 56               | 61               | 84                                | 70                                    | 27                               | 86                                 | 113                                       | Sensitivity only   |
|   | NRS 300 115 kV bus (SVP)  | P2       | Bus                  | 92                             | 95               | 98               | 35                   | 39                   | 53               | 59               | 64               | 95                                | 68                                    | 41                               | 98                                 | 118                                       | Sensitivity only   |



| Overloaded Facility                  | Contingency (All and Worst P6)                  | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions   |
|--------------------------------------|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|--|
|                                      |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |  |
| NRS-Scott No. 1 115 kV Line          | DVR Gen Units (SVP) & NRS-SRS #2 115kV (SVP)    | P3       | G-1/N-1              | <100                           | <100             | 101              | <100                 | <100                 | <100             | <100             | <100             | 100                               | <100                                  | <100                             | 101                                | 121                                       | SVP local generation redispatch following first contingency  |
|                                      | NRS-SRS #2 115kV (SVP) & NRS-MISSION 60kV (SVP) | P6       | N-1-1                | 104                            | 112              | 115              | <100                 | <100                 | <100             | <100             | <100             | 113                               | <100                                  | <100                             | 115                                | 171                                       | SVP local generation redispatch following first contingency  |
|                                      | Newark - Kifer & FMC - Kifer 115 kV Lines       | P7       | DCTL                 | 56                             | 58               | 61               | 17                   | 23                   | 41               | 44               | 48               | 58                                | 54                                    | 23                               | 61                                 | 104                                       | Sensitivity only   |
| NRS-Scott No. 2 115 kV Line          | NRS-SRS #1 115kV (SVP)                          | P1       | N-1                  | 85                             | 83               | 86               | 24                   | 25                   | 53               | 56               | 61               | 84                                | 70                                    | 27                               | 86                                 | 112                                       | Sensitivity only   |
|                                      | NRS 400 115 kV bus (SVP)                        | P2       | Bus                  | 76                             | 73               | 77               | 18                   | 18                   | 52               | 53               | 58               | 73                                | 69                                    | 21                               | 77                                 | 112                                       | Sensitivity only   |
|                                      | DVR Gen Units (SVP) & NRS-SRS #1 115kV (SVP)    | P3       | G-1/N-1              | <100                           | <100             | 101              | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | 101                                | 121                                       | SVP local generation redispatch following first contingency  |
|                                      | NRS-SRS #1 115kV (SVP) & NRS-MISSION 60kV (SVP) | P6       | N-1-1                | 104                            | 112              | 115              | <100                 | <100                 | <100             | <100             | <100             | 113                               | <100                                  | <100                             | 115                                | 172                                       | SVP local generation redispatch following first contingency  |
|                                      | Newark - Kifer & FMC - Kifer 115 kV Lines       | P7       | DCTL                 | 55                             | 57               | 61               | 17                   | 22                   | 41               | 44               | 48               | 57                                | 53                                    | 22                               | 61                                 | 103                                       | Sensitivity only   |
| Oakland C - Oakland L #1 115kV Cable | CLARMNT 115kV - Section 2D & 1D                 | P2       | Bus-Tie-Breaker      | 99                             | 101              | 109              | 57                   | 60                   | 111              | 114              | 123              | 105                               | 77                                    | 56                               | 109                                | 109                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates overloads in 2024 summer peak. Winter peak loads are under review. For 2029, continue to monitor the future load forecast. |
|                                      | K-D #1 & #2 115kV                               | P6       | N-1-1                | 99                             | 101              | 109              | 57                   | 59                   | 111              | 114              | 123              | 105                               | 77                                    | 56                               | 109                                | 109                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates overloads in 2024 summer peak. Winter peak loads are under review. For 2029, continue to monitor the future load forecast. |
| Oakland C - Oakland X #2 115kV Cable | CLARMNT 115kV - Section 2D & 1D                 | P2       | Bus-Tie-Breaker      | 114                            | 114              | 121              | 76                   | 73                   | 123              | 123              | 130              | 42                                | 76                                    | 70                               | 121                                | 121                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, doesn't mitigate identified overloads. Winter peak loads are under review. For 2029, continue to monitor the future load forecast.   |
|                                      | C-X #3 115kV & D-L #1 115kV                     | P6       | N-1-1                | 121                            | 120              | 127              | 80                   | 77                   | 121              | 121              | 127              | <100                              | <100                                  | <100                             | 127                                | 127                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, doesn't mitigate identified overloads. Winter peak loads are under review. For 2029, continue to monitor the future load forecast.   |
|                                      | OAK C115 - ME 115kV & OAKLAND C-MARITIME line   | P2       | Non-Bus-Tie Breaker  | 94                             | 96               | 105              | 54                   | 54                   | 93               | 97               | 104              | 67                                | 70                                    | 52                               | 105                                | 105                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation<br>Project, as modeled, mitigates the identified overloads.  |





| Overloaded Facility                      | Contingency (All and Worst P6)                                  | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions  |
|--|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|---|
|  |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |   |
| Oakland D - Oakland L 115kV Cable        | MORAGA 230kV - Section 2D & 1D                                  | P2       | Bus-Tie-Breaker      | 85                             | 92               | 101              | 55                   | 59                   | 76               | 79               | 89               | 64                                | 68                                    | 49                               | 101                                | 101                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates the identified overloads.  |
|  | STATIN X 115kV - Section 2D & 1D                                | P2       | Bus-Tie-Breaker      | 133                            | NA               | NA               | 92                   | NA                   | 134              | NA               | NA               | NA                                | NA                                    | NA                               | NA                                 | NA  | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates the identified overloads.  |
|  | OAK C115 115kV Section ME                                       | P2       | Bus                  | 91                             | 94               | 105              | 54                   | 54                   | 91               | 94               | 104              | 67                                | 70                                    | 52                               | 105                                | 105                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, mitigates the identified overloads.  |
|  | C-X #2 & #3 115kV   | P6       | N-1-1                | 120                            | 120              | 128              | 79                   | 76                   | 121              | 120              | 127              | <100                              | <100                                  | <100                             | 128                                | 127                                       | Project: Oakland Clean Energy Initiative<br>In-service date: 8/22<br>Short term: Generation Project, as modeled, doesn't mitigate identified overloads. Winter peak loads are under review. For 2029, continue to monitor the future load forecast. |
| Oleum-Christie 115kV Line                | UNION CH 9.11kV Gen Unit 1 & CHRISTIE-SOBRANTE 115kV            | P3       | G-1/N-1              | 109                            | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | <100                                      | Project: North Tower 115 kV Looping Project<br>In-service date: 12/21<br>Short term: Action Plan  |
|  | Sobrante-G Nos. 1 & 2 115 kV lines                              | P7       | DCTL                 | <100                           | <100             | 87               | <100                 | <100                 | <100             | <100             | 54               | <100                              | <100                                  | <100                             | 114                                | 86  | Sensitivity only  |
| San Jose B bus tie                       | NEWARK E-F BUS TIE 230kV & LOS ESTEROS-METCALF 230kV            | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 103                                       | Sensitivity only  |
| San Jose 'B'-Stone-Evergreen 115 kV Line | Metcalf - El Patio No. 1 & 2 115 kV Lines                       | P7       | DCTL                 | 66                             | 71               | 77               | 66                   | 72                   | 58               | 67               | 60               | 73                                | 74                                    | 65                               | 80                                 | 110                                       | Sensitivity only  |
| San Jose Sta 'A'-'B' 115 kV Line         | EVRGRN 115kV Section 1D   | P2       | Bus                  | 55                             | 61               | 67               | 61                   | 69                   | 52               | 61               | 54               | 63                                | 60                                    | 61                               | 69                                 | 104                                       | Sensitivity only  |
|  | MTCALF E 115kV - Section 1E & 2E                                | P2       | Bus-Tie-Breaker      | 92                             | 102              | 111              | 77                   | 86                   | 75               | 95               | 85               | 106                               | 88                                    | 70                               | 114                                | 155                                       | Continue to monitor future load forecast  |
|  | MTCALF E 115kV Section 1X                                       | P2       | Non-Bus-Tie Breaker  | 54                             | 69               | 72               | 53                   | 59                   | 48               | 59               | 53               | 71                                | 55                                    | 51                               | 75                                 | 109                                       | Sensitivity only  |
|  | MTCALF E 115kV Section 1Y                                       | P2       | Non-Bus-Tie Breaker  | 55                             | 68               | 72               | 53                   | 60                   | 48               | 59               | 53               | 71                                | 55                                    | 51                               | 75                                 | 109                                       | Sensitivity only  |
|  | MTCALF E 115kV Section 2E                                       | P2       | Bus                  | 60                             | 66               | 73               | 55                   | 62                   | 52               | 63               | 57               | 69                                | 60                                    | 53                               | 76                                 | 106                                       | Sensitivity only  |
|  | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus            | P2       | Bus-Tie-Breaker      | 65                             | 70               | 74               | 51                   | 57                   | 51               | 59               | 56               | 71                                | 62                                    | 52                               | 77                                 | 119                                       | Sensitivity only  |
|  | DVR Gen Units (SVP) & SAN JOSE B-STONE-EVERGREEN 115kV          | P3       | G-1/N-1              | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 103                                       | Sensitivity only  |
|  | LOS ESTEROS 115kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)  | P5       | Non-Redundant Relay  | 68                             | 75               | 81               | 47                   | 54                   | 57               | 68               | 63               | 77                                | 66                                    | 47                               | 83                                 | 107                                       | Sensitivity only  |
|  | LOS ESTEROS 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 65                             | 71               | 79               | 57                   | 65                   | 50               | 59               | 56               | 73                                | 65                                    | 57                               | 82                                 | 120                                       | Sensitivity only  |

Study Area: PG&E Greater Bay Area

Thermal Overloads



| Overloaded Facility   | Contingency (All and Worst P6)  | Category | Category Description | Loading % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Loading % (Sensitivity Scenarios) |                                       |                                  |                                    |   | ISO Approved Projects & Potential Mitigation Solutions  |
|---|---|----------|----------------------|--------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|-----------------------------------|---------------------------------------|----------------------------------|------------------------------------|---|---|
|   |   |          |                      | 2021 Summer Peak               | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast         | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generation s | 2029 Summer Peak High SVP Forecasted Load |   |
|   | LOS ESTEROS 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)       | P5       | Non-Redundant Relay  | 71                             | 77               | 86               | 66                   | 73                   | 55               | 65               | 61               | 80                                | 69                                    | 66                               | 89                                 | 129                                       | Sensitivity only  |
|   | PALO ALTO SW. STA. 115kV DBDB BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 68                             | 75               | 81               | 47                   | 54                   | 57               | 68               | 64               | 78                                | 67                                    | 47                               | 83                                 | 112                                       | Sensitivity only  |
|   | NEWARK E-F BUS TIE 230kV & LOS ESTEROS-METCALF 230kV                  | P6       | N-1-1                | <100                           | <100             | <100             | <100                 | <100                 | <100             | <100             | <100             | <100                              | <100                                  | <100                             | <100                               | 133                                       | Sensitivity only  |
|   | Metcalf - Evergreen #1 and #2 115 kV Lines                            | P7       | DCTL                 | 83                             | 90               | 98               | 68                   | 76                   | 69               | 83               | 75               | 93                                | 81                                    | 65                               | 101                                | 138                                       | Sensitivity only  |
|   | Newark - Los Esteros & Los Esteros - Metcalf 230 kV Lines             | P7       | DCTL                 | 71                             | 77               | 86               | 66                   | 73                   | 55               | 65               | 61               | 80                                | 69                                    | 66                               | 89                                 | 129                                       | Sensitivity only  |
|   | Tesla - Newark No.2 and Metcalf - Los Esteros 230 kV lines            | P7       | DCTL                 | 55                             | 61               | 70               | 56                   | 63                   | 51               | 58               | 54               | 64                                | 57                                    | 54                               | 73                                 | 103                                       | Sensitivity only  |
| San Leandro - Oakland J #1 115kV Line                           | GRANT-EDES 115kV & MORAGA-OAKLAND J 115kV                             | P6       | N-1-1                | 101                            | <100             | <100             | <100                 | <100                 | 101              | 101              | 101              | <100                              | <100                                  | <100                             | <100                               | <100                                      | Project: East Shore - Oakland J 115 kV Reconductoring Project<br>In-service date: 4/21<br>Short term: Action plan |
| San Mateo-Belmont 115kV Line                                    | RAVENSWD 230/115kV TB 1 & RAVENSWD 230/115kV TB 2                     | P6       | N-1-1                | <100                           | <100             | 100              | <100                 | <100                 | <100             | <100             | <100             | 100                               | <100                                  | <100                             | <100                               | 107                                       | Continue to monitor future load forecast  |
| Saratoga-Vasona 230 kV Line                                     | Metcalf-Monta Vista No. 3 & Monta Vista-Coyote Sw. Sta. 230 kV Line   | P7       | DCTL                 | 84                             | 88               | 92               | 74                   | 82                   | 78               | 85               | 76               | 91                                | 79                                    | 76                               | 94                                 | 104                                       | Sensitivity only  |
| Scott-Duane 115 kV Line   | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus                  | P2       | Bus-Tie-Breaker      | 66                             | 77               | 82               | 32                   | 44                   | 55               | 67               | 72               | 78                                | 64                                    | 43                               | 83                                 | 141                                       | Sensitivity only  |
| Sobrante-El Cerrito STA G #2 115kV Line                         | SOBRANTE - 1D 115kV & SOBRANTE-G #1 line                              | P2       | Non-Bus-Tie Breaker  | <100                           | 61               | 82               | <100                 | 54                   | <100             | 65               | 56               | 65                                | <100                                  | 51                               | 103                                | 82  | Sensitivity only  |
|   | SOBRANTE - 1D 115kV & SOBRANTE-GRIZZLY-CLAREMONT #1 line              | P2       | Non-Bus-Tie Breaker  | <100                           | 61               | 82               | <100                 | 55                   | <100             | 65               | 56               | 65                                | <100                                  | 52                               | 103                                | 82  | Sensitivity only  |
|   | SOBRANTE - 1D 115kV & SOBRANTE-NRTH TWR line                          | P2       | Non-Bus-Tie Breaker  | <100                           | 61               | 82               | <100                 | 54                   | <100             | 65               | 56               | 65                                | <100                                  | 51                               | 103                                | 82  | Sensitivity only  |
|   | SOBRANTE - 1D 115kV & SOBRANTE-R #1 line                              | P2       | Non-Bus-Tie Breaker  | <100                           | 61               | 82               | <100                 | 55                   | <100             | 65               | 56               | 65                                | <100                                  | 52                               | 103                                | 82  | Sensitivity only  |
|   | SOBRANTE - 1D 115kV & SOBRANTE-SAN PBLO-STD. OIL line                 | P2       | Non-Bus-Tie Breaker  | <100                           | 61               | 82               | <100                 | 54                   | <100             | 65               | 56               | 65                                | <100                                  | 51                               | 103                                | 82  | Sensitivity only  |
|   | SOBRANTE 115kV - Section 1D & 2D                                      | P2       | Bus-Tie-Breaker      | 97                             | 65               | 87               | 63                   | 56                   | 65               | 69               | 60               | 69                                | 88                                    | 53                               | 108                                | 86  | Sensitivity only  |
| Sobrante-Grizzly-Claremont #2 115kV Line (Hillside-Grizzly JCT) | MORAGA 230kV - Section 2D & 1D  | P2       | Bus-Tie-Breaker      | 84                             | 94               | 109              | 51                   | 56                   | 59               | 66               | 76               | 65                                | 62                                    | 55                               | 109                                | 109                                       | Continue to monitor future load forecast  |
| Trimble-San Jose 'B' 115 kV Line                                | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus                  | P2       | Bus-Tie-Breaker      | 81                             | 80               | 86               | 25                   | 20                   | 52               | 55               | 66               | 81                                | 68                                    | 29                               | 85                                 | 109                                       | Sensitivity only  |
| Whisman-Monta Vista 115 kV Line                                 | MNTA VSA 115kV - Middle Breaker Bay 4                                 | P2       | Non-Bus-Tie Breaker  | <100                           | 81               | 92               | <100                 | <100                 | <100             | 84               | 71               | 83                                | <100                                  | 98                               | 95                                 | 117                                       | Sensitivity only  |

Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation      | Contingency (All and Worst P6) | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|-----------------|--------------------------------|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                 |                                |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| A100US 115 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.04             | 1.06                 | 1.07                 | 1.05             | 1.05             | 1.04             | 1.04                               | 1.05                                  | 1.07                             | 1.05                              | 1.04                                      | Load power factor correction and voltage support if needed |
| ALHAMBRA 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.02             | 1.07                 | 1.07                 | 1.05             | 1.05             | 1.03             | 1.05                               | 1.05                                  | 1.07                             | 1.00                              | 1.02                                      | Load power factor correction and voltage support if needed |
| ALMADEN 60 kV   | Base Case                      | P0       | Base Case            | 1.00                            | 1.00             | 0.95             | 1.14                 | 1.12                 | 1.05             | 1.03             | 0.99             | 1.00                               | 1.02                                  | 1.14                             | 0.95                              | 0.93                                      | Load power factor correction and voltage support if needed |
| ALTAMONT 60 kV  | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.03             | 1.06                 | 1.05                 | 1.04             | 1.04             | 1.04             | 1.03                               | 1.03                                  | 1.06                             | 1.04                              | 1.03                                      | Load power factor correction and voltage support if needed |
| AMES BS1 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.06                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| AMES BS2 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.06                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| AMES DST 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.06                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| BAIR 60 kV      | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.06                 | 1.07                 | 1.04             | 1.04             | 1.01             | 1.03                               | 1.04                                  | 1.07                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| BAIR 115 kV     | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.07                 | 1.08                 | 1.03             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.09                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| BARTLP 115 kV   | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.00             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.02             | 1.03                               | 1.03                                  | 1.10                             | 1.00                              | 0.99                                      | Load power factor correction and voltage support if needed |
| BARTRC 115 kV   | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.07                 | 1.07                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.08                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| BAY MDWS 115 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.09                 | 1.10                 | 1.04             | 1.05             | 1.02             | 1.03                               | 1.04                                  | 1.11                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| BAYSHOR1 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.05             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.07             | 1.03             | 1.04                               | 1.05                                  | 1.14                             | 1.03                              | 1.05                                      | Load power factor correction and voltage support if needed |
| BAYSHOR2 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.05             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.07             | 1.03             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.05                                      | Load power factor correction and voltage support if needed |
| BELMONT 115 kV  | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.08                 | 1.09                 | 1.03             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.09                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| BERESFRD 60 kV  | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.09                 | 1.11                 | 1.04             | 1.05             | 1.02             | 1.04                               | 1.04                                  | 1.11                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| BIXLER 60 kV    | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 1.02             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.04             | 1.02                               | 1.02                                  | 1.06                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| BOLLMAN 115 kV  | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.03             | 1.08                 | 1.08                 | 1.05             | 1.05             | 1.04             | 1.05                               | 1.05                                  | 1.08                             | 1.01                              | 1.02                                      | Load power factor correction and voltage support if needed |
| BURLNGME 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.09                 | 1.11                 | 1.04             | 1.05             | 1.02             | 1.04                               | 1.04                                  | 1.11                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| CAL MEC 230 kV  | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.07                 | 1.07                 | 1.04             | 1.03             | 1.02             | 1.02                               | 1.03                                  | 1.07                             | 1.01                              | 1.00                                      | Load power factor correction and voltage support if needed |
| CAL_TAP3 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.06                 | 1.06                 | 1.04             | 1.03             | 1.02             | 1.03                               | 1.04                                  | 1.06                             | 1.02                              | 1.00                                      | Load power factor correction and voltage support if needed |
| CAL_TAP4 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.06                 | 1.06                 | 1.04             | 1.03             | 1.02             | 1.03                               | 1.04                                  | 1.06                             | 1.02                              | 1.00                                      | Load power factor correction and voltage support if needed |
| CALEVRAS 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.06                 | 1.06                 | 1.04             | 1.03             | 1.02             | 1.03                               | 1.04                                  | 1.06                             | 1.02                              | 1.00                                      | Load power factor correction and voltage support if needed |

Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation         | Contingency (All and Worst P6) | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|--------------------|--------------------------------|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                    |                                |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| CALMAT60 60 kV     | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.00             | 1.08                 | 1.08                 | 1.05             | 1.05             | 1.01             | 1.05                               | 1.05                                  | 1.09                             | 0.99                              | 0.98                                      | Load power factor correction and voltage support if needed |
| CALTRAINSSF 115 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.09                 | 1.11                 | 1.03             | 1.05             | 1.02             | 1.03                               | 1.03                                  | 1.12                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| CALTRAINSSJ 115 kV | Base Case                      | P0       | Base Case            | 1.01                            | 1.01             | 0.99             | 1.07                 | 1.07                 | 1.04             | 1.03             | 1.01             | 1.01                               | 1.02                                  | 1.08                             | 0.99                              | 0.96                                      | Load power factor correction and voltage support if needed |
| CAROLD1 60 kV      | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.09                 | 1.12                 | 1.04             | 1.05             | 1.03             | 1.04                               | 1.04                                  | 1.13                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| CAROLD2 60 kV      | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.10                 | 1.14                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.15                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| CAROLNDS 60 kV     | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.09                 | 1.12                 | 1.04             | 1.05             | 1.03             | 1.04                               | 1.04                                  | 1.13                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| CASTROVL 230 kV    | Base Case                      | P0       | Base Case            | 1.01                            | 1.01             | 0.99             | 1.06                 | 1.06                 | 1.02             | 1.02             | 1.00             | 1.01                               | 1.01                                  | 1.06                             | 0.98                              | 0.97                                      | Load power factor correction and voltage support if needed |
| CHRISTIE 115 kV    | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.01             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.04                               | 1.04                                  | 1.06                             | 1.00                              | 1.01                                      | Load power factor correction and voltage support if needed |
| CHSR04A 115 kV     | Base Case                      | P0       | Base Case            | 0.00                            | 1.04             | 1.02             | 0.00                 | 1.07                 | 0.00             | 1.04             | 1.03             | 1.04                               | 0.00                                  | 1.10                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| CHSR04B 115 kV     | Base Case                      | P0       | Base Case            | 0.00                            | 1.04             | 1.02             | 0.00                 | 1.07                 | 0.00             | 1.04             | 1.03             | 1.04                               | 0.00                                  | 1.10                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| CHSR04SWSTA 115 kV | Base Case                      | P0       | Base Case            | 0.00                            | 1.04             | 1.02             | 0.00                 | 1.08                 | 0.00             | 1.04             | 1.03             | 1.04                               | 0.00                                  | 1.10                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| CLAYTN 115 kV      | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.02             | 1.09                 | 1.09                 | 1.06             | 1.07             | 1.04             | 1.06                               | 1.05                                  | 1.10                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| CLMBIAHS 115 kV    | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.03             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.05             | 1.06                               | 1.05                                  | 1.10                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| CLMBIAPV 115 kV    | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.03             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.05             | 1.06                               | 1.05                                  | 1.10                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| CLY LND 115 kV     | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.03             | 1.08                 | 1.09                 | 1.04             | 1.05             | 1.03             | 1.04                               | 1.05                                  | 1.10                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| CON25 115 kV       | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.01             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.05                               | 1.05                                  | 1.06                             | 1.00                              | 1.01                                      | Load power factor correction and voltage support if needed |
| CRYOGEN 115 kV     | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.00             | 1.07                 | 1.06                 | 1.04             | 1.03             | 1.01             | 1.04                               | 1.05                                  | 1.07                             | 1.00                              | 0.98                                      | Load power factor correction and voltage support if needed |
| CRYSTLSG 60 kV     | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.10                 | 1.14                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.15                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| CV BART 230 kV     | Base Case                      | P0       | Base Case            | 1.01                            | 1.01             | 0.99             | 1.06                 | 1.06                 | 1.02             | 1.02             | 1.00             | 1.01                               | 1.01                                  | 1.06                             | 0.98                              | 0.97                                      | Load power factor correction and voltage support if needed |
| CYTE PMP 115 kV    | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.04             | 1.11                 | 1.10                 | 1.07             | 1.06             | 1.05             | 1.05                               | 1.06                                  | 1.11                             | 1.04                              | 1.02                                      | Load power factor correction and voltage support if needed |
| DALY CTY 115 kV    | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.13                 | 1.04             | 1.06             | 1.02             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.04                                      | Load power factor correction and voltage support if needed |
| DIXON LD 115 kV    | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.08                 | 1.07                 | 1.05             | 1.04             | 1.02             | 1.03                               | 1.03                                  | 1.08                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| DLY CTYP 115 kV    | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.04                                      | Load power factor correction and voltage support if needed |

Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation        | Contingency (All and Worst P6) | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|-------------------|--------------------------------|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                   |                                |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| DUMBARTN 115 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.03             | 1.06                 | 1.07                 | 1.04             | 1.04             | 1.03             | 1.04                               | 1.04                                  | 1.07                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| DYERWND 60 kV     | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.03             | 1.06                 | 1.05                 | 1.04             | 1.04             | 1.04             | 1.03                               | 1.04                                  | 1.06                             | 1.04                              | 1.03                                      | Load power factor correction and voltage support if needed |
| E DUBLIN 60 kV    | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.00             | 1.08                 | 1.08                 | 1.05             | 1.05             | 1.01             | 1.04                               | 1.04                                  | 1.09                             | 0.99                              | 0.99                                      | Load power factor correction and voltage support if needed |
| E. SHORE 230 kV   | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.07                 | 1.08                 | 1.03             | 1.04             | 1.01             | 1.03                               | 1.03                                  | 1.08                             | 1.01                              | 1.00                                      | Load power factor correction and voltage support if needed |
| EASTSHRE 115 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.04             | 1.05                 | 1.07                 | 1.05             | 1.05             | 1.04             | 1.05                               | 1.05                                  | 1.07                             | 1.05                              | 1.04                                      | Load power factor correction and voltage support if needed |
| EBMUDGRY 115 kV   | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.01             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.03             | 1.06                               | 1.06                                  | 1.09                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| EDENVALE 115 kV   | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.03             | 1.10                 | 1.10                 | 1.07             | 1.06             | 1.04             | 1.05                               | 1.06                                  | 1.11                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| EDES 115 kV       | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.02             | 1.05                 | 1.06                 | 1.05             | 1.05             | 1.03             | 1.05                               | 1.05                                  | 1.06                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| EDS GRNT 115 kV   | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.02             | 1.05                 | 1.06                 | 1.05             | 1.05             | 1.03             | 1.05                               | 1.05                                  | 1.06                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| EGBERT 230 kV     | Base Case                      | P0       | Base Case            | 0.00                            | 1.04             | 1.01             | 0.00                 | 1.12                 | 0.00             | 1.05             | 1.02             | 1.04                               | 0.00                                  | 1.13                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| EL CRRTO 115 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.01             | 1.06                 | 1.05                 | 1.04             | 1.04             | 1.02             | 1.04                               | 1.04                                  | 1.06                             | 1.00                              | 1.01                                      | Load power factor correction and voltage support if needed |
| EL PATIO 115 kV   | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 1.00             | 1.09                 | 1.08                 | 1.05             | 1.04             | 1.02             | 1.02                               | 1.03                                  | 1.09                             | 1.00                              | 0.97                                      | Load power factor correction and voltage support if needed |
| EMBRCDRD 230 kV   | Base Case                      | P0       | Base Case            | 1.02                            | 1.04             | 1.01             | 1.09                 | 1.12                 | 1.03             | 1.05             | 1.02             | 1.03                               | 1.03                                  | 1.13                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| EMRLD LE 60 kV    | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.02             | 1.10                 | 1.14                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.06                                  | 1.15                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| EST GRND 115 kV   | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.09                 | 1.11                 | 1.03             | 1.05             | 1.02             | 1.03                               | 1.03                                  | 1.12                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| EVERGREN 60 kV    | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 0.98             | 1.12                 | 1.11                 | 1.06             | 1.04             | 1.01             | 1.01                               | 1.03                                  | 1.12                             | 0.98                              | 0.96                                      | Load power factor correction and voltage support if needed |
| EVRGRN 1 115 kV   | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 1.00             | 1.09                 | 1.09                 | 1.06             | 1.04             | 1.02             | 1.02                               | 1.03                                  | 1.10                             | 1.00                              | 0.97                                      | Load power factor correction and voltage support if needed |
| FMC 115 kV        | Base Case                      | P0       | Base Case            | 1.01                            | 1.01             | 0.99             | 1.07                 | 1.07                 | 1.04             | 1.03             | 1.01             | 1.01                               | 1.02                                  | 1.08                             | 0.99                              | 0.96                                      | Load power factor correction and voltage support if needed |
| FOREBAYWIND 60 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.09                 | 1.09                 | 1.05             | 1.05             | 1.02             | 1.04                               | 1.05                                  | 1.09                             | 1.00                              | 0.99                                      | Load power factor correction and voltage support if needed |
| FREMNT 115 kV     | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.07                 | 1.07                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.07                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| FRICKWND 60 kV    | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.09                 | 1.09                 | 1.05             | 1.05             | 1.02             | 1.04                               | 1.05                                  | 1.09                             | 1.00                              | 0.99                                      | Load power factor correction and voltage support if needed |
| GILROY 115 kV     | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.07                 | 1.07                 | 1.05             | 1.04             | 1.03             | 1.04                               | 1.04                                  | 1.10                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| GILROY F 115 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.07                 | 1.07                 | 1.05             | 1.04             | 1.03             | 1.04                               | 1.04                                  | 1.10                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |



Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation      | Contingency (All and Worst P6) | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|-----------------|--------------------------------|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                 |                                |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| GILROYPK 115 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.07                 | 1.07                 | 1.05             | 1.04             | 1.03             | 1.04                               | 1.04                                  | 1.10                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| GILROYTP 115 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.07                 | 1.07                 | 1.05             | 1.04             | 1.03             | 1.04                               | 1.04                                  | 1.10                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| GRANT 115 kV    | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.03             | 1.05                 | 1.06                 | 1.05             | 1.05             | 1.03             | 1.05                               | 1.05                                  | 1.07                             | 1.04                              | 1.03                                      | Load power factor correction and voltage support if needed |
| HICKS 230 kV    | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.01             | 1.09                 | 1.09                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.10                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| HILDAL47 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.10                 | 1.14                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.15                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| HILDAL49 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.09                 | 1.12                 | 1.05             | 1.06             | 1.03             | 1.04                               | 1.05                                  | 1.13                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| HILLSDLE 60 kV  | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.09                 | 1.11                 | 1.04             | 1.05             | 1.03             | 1.04                               | 1.04                                  | 1.12                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| HLF MNBY 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.03             | 1.09                 | 1.12                 | 1.04             | 1.06             | 1.03             | 1.04                               | 1.04                                  | 1.13                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| HLLSDLJT 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.09                 | 1.12                 | 1.05             | 1.06             | 1.03             | 1.04                               | 1.05                                  | 1.13                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| HNTRS PT 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.07             | 1.03             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.04                                      | Load power factor correction and voltage support if needed |
| IBM-BALY 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.04             | 1.11                 | 1.10                 | 1.07             | 1.06             | 1.05             | 1.05                               | 1.06                                  | 1.11                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| IBM-CTLE 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.03             | 1.10                 | 1.10                 | 1.07             | 1.06             | 1.04             | 1.05                               | 1.06                                  | 1.11                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| IBM-HR J 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.03             | 1.10                 | 1.10                 | 1.07             | 1.06             | 1.04             | 1.04                               | 1.05                                  | 1.11                             | 1.03                              | 1.01                                      | Load power factor correction and voltage support if needed |
| IBM-HRRS 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.03             | 1.10                 | 1.10                 | 1.07             | 1.06             | 1.04             | 1.05                               | 1.06                                  | 1.11                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| IMHOFF 115 kV   | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.03             | 1.07                 | 1.07                 | 1.05             | 1.05             | 1.04             | 1.05                               | 1.05                                  | 1.08                             | 1.01                              | 1.02                                      | Load power factor correction and voltage support if needed |
| IUKA 60 kV      | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.00             | 1.08                 | 1.08                 | 1.05             | 1.05             | 1.01             | 1.04                               | 1.05                                  | 1.08                             | 0.99                              | 0.98                                      | Load power factor correction and voltage support if needed |
| JARVIS 115 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.00             | 1.07                 | 1.06                 | 1.04             | 1.03             | 1.01             | 1.04                               | 1.05                                  | 1.07                             | 1.00                              | 0.98                                      | Load power factor correction and voltage support if needed |
| JEFFERSN 230 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.04                               | 1.05                                  | 1.13                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| JEFRSN_D 60 kV  | Base Case                      | P0       | Base Case            | 1.05                            | 1.06             | 1.02             | 1.10                 | 1.14                 | 1.06             | 1.06             | 1.04             | 1.05                               | 1.06                                  | 1.15                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| JEFRSN_E 60 kV  | Base Case                      | P0       | Base Case            | 1.05                            | 1.06             | 1.02             | 1.10                 | 1.14                 | 1.06             | 1.06             | 1.04             | 1.05                               | 1.06                                  | 1.15                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| JENING J 60 kV  | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 0.98             | 1.12                 | 1.11                 | 1.06             | 1.04             | 1.01             | 1.01                               | 1.03                                  | 1.12                             | 0.98                              | 0.95                                      | Load power factor correction and voltage support if needed |
| JMDAMCX1 230 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.14                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| JMDAMCX2 230 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.14                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |

Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation      | Contingency (All and Worst P6) | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|-----------------|--------------------------------|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                 |                                |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| JV BART 115 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.00             | 1.07                 | 1.06                 | 1.04             | 1.03             | 1.01             | 1.04                               | 1.05                                  | 1.07                             | 1.00                              | 0.98                                      | Load power factor correction and voltage support if needed |
| KIRKER 115 kV   | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.03             | 1.10                 | 1.09                 | 1.06             | 1.06             | 1.05             | 1.06                               | 1.05                                  | 1.10                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| LAKEWD-C 115 kV | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.01             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.03             | 1.06                               | 1.05                                  | 1.09                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| LAKEWD-M 115 kV | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.01             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.03             | 1.06                               | 1.05                                  | 1.09                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| LARKIN D 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.07             | 1.03             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.04                                      | Load power factor correction and voltage support if needed |
| LARKIN E 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.07             | 1.03             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.04                                      | Load power factor correction and voltage support if needed |
| LARKIN F 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.07             | 1.03             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.04                                      | Load power factor correction and voltage support if needed |
| LAS PLGS 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.10                 | 1.14                 | 1.05             | 1.06             | 1.02             | 1.04                               | 1.05                                  | 1.15                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| LIVERMRE 60 kV  | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.00             | 1.09                 | 1.09                 | 1.05             | 1.05             | 1.01             | 1.05                               | 1.05                                  | 1.09                             | 1.00                              | 0.99                                      | Load power factor correction and voltage support if needed |
| LK_REACT 115 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.05                 | 1.06                 | 1.05             | 1.05             | 1.04             | 1.04                               | 1.04                                  | 1.06                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| LLAGAS 115 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.08                 | 1.07                 | 1.05             | 1.04             | 1.03             | 1.04                               | 1.04                                  | 1.10                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| LMEC 115 kV     | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.04             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.05             | 1.06                               | 1.05                                  | 1.10                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| LONESTAR 115 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.02             | 1.07                 | 1.08                 | 1.03             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.08                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| LOS ALTS 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.03             | 1.07                 | 1.06                 | 1.04             | 1.05             | 1.02             | 1.04                               | 1.04                                  | 1.07                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| LOYOLA 60 kV    | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.04             | 1.07                 | 1.05                 | 1.04             | 1.04             | 1.03             | 1.04                               | 1.04                                  | 1.06                             | 1.04                              | 1.04                                      | Load power factor correction and voltage support if needed |
| LPOSTAS 60 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.09                 | 1.09                 | 1.05             | 1.05             | 1.02             | 1.04                               | 1.05                                  | 1.09                             | 1.00                              | 1.00                                      | Load power factor correction and voltage support if needed |
| LS PSTAS 230 kV | Base Case                      | P0       | Base Case            | 1.01                            | 1.01             | 0.99             | 1.06                 | 1.06                 | 1.03             | 1.02             | 1.01             | 1.01                               | 1.01                                  | 1.06                             | 0.99                              | 0.98                                      | Load power factor correction and voltage support if needed |
| MABURY 60 kV    | Base Case                      | P0       | Base Case            | 1.01                            | 1.01             | 0.98             | 1.12                 | 1.11                 | 1.06             | 1.04             | 1.00             | 1.01                               | 1.02                                  | 1.12                             | 0.98                              | 0.95                                      | Load power factor correction and voltage support if needed |
| MABURY 115 kV   | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.00             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.02             | 1.03                               | 1.03                                  | 1.10                             | 1.00                              | 0.99                                      | Load power factor correction and voltage support if needed |
| MARKHAM 115 kV  | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 0.99             | 1.08                 | 1.08                 | 1.05             | 1.03             | 1.01             | 1.01                               | 1.02                                  | 1.09                             | 0.99                              | 0.97                                      | Load power factor correction and voltage support if needed |
| MARTIN C 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.04                                      | Load power factor correction and voltage support if needed |
| MARTIN C 230 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.04             | 1.01             | 1.09                 | 1.12                 | 1.03             | 1.05             | 1.02             | 1.04                               | 1.03                                  | 1.13                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| MARTN S4 230 kV | Base Case                      | P0       | Base Case            | 0.00                            | 1.04             | 1.01             | 0.00                 | 1.12                 | 0.00             | 1.05             | 1.02             | 1.04                               | 0.00                                  | 1.13                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |

Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation      | Contingency (All and Worst P6) | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|-----------------|--------------------------------|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                 |                                |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| MARTN S5 230 kV | Base Case                      | P0       | Base Case            | 0.00                            | 1.04             | 1.01             | 0.00                 | 1.12                 | 0.00             | 1.05             | 1.02             | 1.04                               | 0.00                                  | 1.13                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| MARTNZ D 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.02             | 1.07                 | 1.07                 | 1.05             | 1.05             | 1.03             | 1.05                               | 1.05                                  | 1.07                             | 1.00                              | 1.02                                      | Load power factor correction and voltage support if needed |
| MARTNZ E 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.02             | 1.07                 | 1.07                 | 1.05             | 1.05             | 1.03             | 1.05                               | 1.05                                  | 1.07                             | 1.00                              | 1.02                                      | Load power factor correction and voltage support if needed |
| MCKEE 115 kV    | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.10                 | 1.09                 | 1.06             | 1.05             | 1.02             | 1.03                               | 1.04                                  | 1.10                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| MEDW LNE 115 kV | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.01             | 1.09                 | 1.09                 | 1.06             | 1.07             | 1.03             | 1.06                               | 1.06                                  | 1.10                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| METCALF 230 kV  | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.07                 | 1.07                 | 1.03             | 1.03             | 1.02             | 1.02                               | 1.03                                  | 1.07                             | 1.01                              | 1.00                                      | Load power factor correction and voltage support if needed |
| MILLBRAE 60 kV  | Base Case                      | P0       | Base Case            | 1.01                            | 1.06             | 1.01             | 1.12                 | 1.14                 | 1.06             | 1.08             | 1.00             | 1.04                               | 1.06                                  | 1.15                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| MILLBRAE 115 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.04             | 1.02             | 1.10                 | 1.12                 | 1.04             | 1.06             | 1.02             | 1.03                               | 1.04                                  | 1.12                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| MILPITAS 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.07                 | 1.07                 | 1.05             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.08                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| MISSION 115 kV  | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.07             | 1.03             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.04                                      | Load power factor correction and voltage support if needed |
| MLLBRETP 60 kV  | Base Case                      | P0       | Base Case            | 1.00                            | 1.07             | 1.00             | 1.13                 | 1.15                 | 1.07             | 1.09             | 1.00             | 1.04                               | 1.07                                  | 1.16                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| MLLBTP97 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.09                 | 1.12                 | 1.04             | 1.05             | 1.03             | 1.04                               | 1.04                                  | 1.13                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| MNTA VSA 60 kV  | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.06             | 1.06                 | 1.05                 | 1.05             | 1.05             | 1.04             | 1.05                               | 1.05                                  | 1.05                             | 1.06                              | 1.05                                      | Load power factor correction and voltage support if needed |
| MONTAVIS 230 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.11                 | 1.11                 | 1.06             | 1.06             | 1.03             | 1.04                               | 1.05                                  | 1.12                             | 1.01                              | 1.00                                      | Load power factor correction and voltage support if needed |
| MORAGA 230 kV   | Base Case                      | P0       | Base Case            | 1.00                            | 1.01             | 0.98             | 1.07                 | 1.06                 | 1.02             | 1.02             | 1.00             | 1.01                               | 1.01                                  | 1.06                             | 0.97                              | 0.97                                      | Load power factor correction and voltage support if needed |
| MRGN HIL 115 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.09                 | 1.08                 | 1.06             | 1.05             | 1.03             | 1.04                               | 1.05                                  | 1.10                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| MRT RCT2 230 kV | Base Case                      | P0       | Base Case            | 0.00                            | 1.04             | 1.01             | 0.00                 | 1.12                 | 0.00             | 1.05             | 1.02             | 1.04                               | 0.00                                  | 1.13                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| MRT RCTR 230 kV | Base Case                      | P0       | Base Case            | 1.03                            | 0.00             | 0.00             | 1.10                 | 0.00                 | 1.04             | 0.00             | 0.00             | 0.00                               | 1.04                                  | 0.00                             | 0.00                              | 0.00                                      | Load power factor correction and voltage support if needed |
| MT EDEN 115 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.04             | 1.05                 | 1.07                 | 1.05             | 1.05             | 1.04             | 1.04                               | 1.05                                  | 1.07                             | 1.04                              | 1.04                                      | Load power factor correction and voltage support if needed |
| MTCALF D 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.06             | 1.04             | 1.11                 | 1.10                 | 1.07             | 1.06             | 1.05             | 1.05                               | 1.06                                  | 1.11                             | 1.04                              | 1.02                                      | Load power factor correction and voltage support if needed |
| MTCALF E 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.06             | 1.04             | 1.11                 | 1.10                 | 1.07             | 1.06             | 1.05             | 1.05                               | 1.06                                  | 1.11                             | 1.04                              | 1.02                                      | Load power factor correction and voltage support if needed |
| NASA A 115 kV   | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.06                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| NASA B 115 kV   | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.06                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |

Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation      | Contingency (All and Worst P6) | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|-----------------|--------------------------------|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                 |                                |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| NEWARK 60 kV    | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.00             | 1.07                 | 1.07                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.08                             | 1.00                              | 0.99                                      | Load power factor correction and voltage support if needed |
| NEWARK D 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.02             | 1.07                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.07                             | 1.02                              | 1.00                                      | Load power factor correction and voltage support if needed |
| NEWARK E 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.07                 | 1.07                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.07                             | 1.01                              | 1.00                                      | Load power factor correction and voltage support if needed |
| NEWARK F 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.07                 | 1.07                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.07                             | 1.01                              | 1.00                                      | Load power factor correction and voltage support if needed |
| NUMMI 115 kV    | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.06                 | 1.06                 | 1.04             | 1.03             | 1.02             | 1.03                               | 1.03                                  | 1.06                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| NWRK 2 M 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.07                 | 1.07                 | 1.04             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.07                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| OLEUM 115 kV    | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.01             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.05                               | 1.05                                  | 1.06                             | 1.00                              | 1.01                                      | Load power factor correction and voltage support if needed |
| ORACLE60 60 kV  | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.07                 | 1.08                 | 1.03             | 1.04             | 1.01             | 1.03                               | 1.04                                  | 1.08                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| OX_MTN60 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.03             | 1.09                 | 1.12                 | 1.05             | 1.06             | 1.04             | 1.05                               | 1.04                                  | 1.13                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| PARKS 60 kV     | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.00             | 1.08                 | 1.08                 | 1.05             | 1.05             | 1.01             | 1.04                               | 1.04                                  | 1.09                             | 0.99                              | 0.99                                      | Load power factor correction and voltage support if needed |
| PIERCY 115 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.10                 | 1.10                 | 1.07             | 1.06             | 1.04             | 1.04                               | 1.05                                  | 1.11                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| PITSBURG 115 kV | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.03             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.05             | 1.06                               | 1.05                                  | 1.10                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| POT_SVC 115 kV  | Base Case                      | P0       | Base Case            | 1.03                            | 1.05             | 1.02             | 1.11                 | 1.14                 | 1.05             | 1.07             | 1.03             | 1.04                               | 1.05                                  | 1.14                             | 1.03                              | 1.05                                      | Load power factor correction and voltage support if needed |
| POTRERO 115 kV  | Base Case                      | P0       | Base Case            | 1.03                            | 1.05             | 1.02             | 1.11                 | 1.14                 | 1.05             | 1.07             | 1.03             | 1.04                               | 1.05                                  | 1.14                             | 1.03                              | 1.05                                      | Load power factor correction and voltage support if needed |
| POTRERO 230 kV  | Base Case                      | P0       | Base Case            | 1.02                            | 1.04             | 1.01             | 1.09                 | 1.12                 | 1.02             | 1.05             | 1.02             | 1.03                               | 1.03                                  | 1.12                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| PP STEEL 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.00             | 1.05                 | 1.04                 | 1.03             | 1.03             | 1.01             | 1.05                               | 1.05                                  | 1.04                             | 0.98                              | 1.00                                      | Load power factor correction and voltage support if needed |
| PRAXAIR 115 kV  | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.03             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.05             | 1.06                               | 1.05                                  | 1.09                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| PT PINLE 115 kV | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.00             | 1.05                 | 1.04                 | 1.03             | 1.03             | 1.01             | 1.05                               | 1.05                                  | 1.04                             | 0.98                              | 1.00                                      | Load power factor correction and voltage support if needed |
| PTPNLT2 115 kV  | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.00             | 1.05                 | 1.03                 | 1.03             | 1.03             | 1.01             | 1.05                               | 1.05                                  | 1.04                             | 0.97                              | 1.00                                      | Load power factor correction and voltage support if needed |
| PTR_SHNT 230 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.04             | 1.01             | 1.09                 | 1.12                 | 1.02             | 1.05             | 1.02             | 1.03                               | 1.03                                  | 1.12                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| RADUM 60 kV     | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.00             | 1.08                 | 1.08                 | 1.05             | 1.05             | 1.01             | 1.04                               | 1.05                                  | 1.09                             | 0.99                              | 0.98                                      | Load power factor correction and voltage support if needed |
| RALSTON 60 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.10                 | 1.14                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.15                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| RAVENSWD 230 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 1.01             | 1.06                 | 1.06                 | 1.02             | 1.03             | 1.02             | 1.02                               | 1.03                                  | 1.07                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |

Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation      | Contingency (All and Worst P6) | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|-----------------|--------------------------------|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                 |                                |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| REDWOOD 60 kV   | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.01             | 1.03                               | 1.04                                  | 1.07                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| RESEARCH 230 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 1.00             | 1.06                 | 1.06                 | 1.03             | 1.03             | 1.01             | 1.02                               | 1.02                                  | 1.06                             | 0.99                              | 0.99                                      | Load power factor correction and voltage support if needed |
| RLSTN35 60 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.10                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.14                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| RLSTN45 60 kV   | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.10                 | 1.14                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.15                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| ROSSMOOR 230 kV | Base Case                      | P0       | Base Case            | 1.00                            | 1.01             | 0.98             | 1.06                 | 1.06                 | 1.02             | 1.02             | 1.00             | 1.01                               | 1.01                                  | 1.06                             | 0.97                              | 0.97                                      | Load power factor correction and voltage support if needed |
| RUSELCTY 230 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.07                 | 1.08                 | 1.03             | 1.04             | 1.01             | 1.03                               | 1.03                                  | 1.08                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| RVNSWD D 115 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.03             | 1.08                 | 1.09                 | 1.05             | 1.05             | 1.03             | 1.04                               | 1.05                                  | 1.09                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| RVNSWD E 115 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.03             | 1.08                 | 1.09                 | 1.05             | 1.05             | 1.03             | 1.04                               | 1.05                                  | 1.09                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| S.L.A.C. 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.03                 | 1.18                 | 1.03             | 1.04             | 1.02             | 1.05                               | 1.06                                  | 1.19                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| S.L.A.C. 230 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.12                 | 1.05             | 1.06             | 1.03             | 1.04                               | 1.04                                  | 1.13                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| SAN CRLS 60 kV  | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.06                 | 1.07                 | 1.03             | 1.04             | 1.01             | 1.03                               | 1.04                                  | 1.07                             | 1.02                              | 1.01                                      | Load power factor correction and voltage support if needed |
| SAN MATO 60 kV  | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.09                 | 1.10                 | 1.04             | 1.05             | 1.02             | 1.04                               | 1.04                                  | 1.11                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| SAN RAMN 60 kV  | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.00             | 1.09                 | 1.08                 | 1.04             | 1.05             | 1.02             | 1.04                               | 1.04                                  | 1.09                             | 0.99                              | 0.99                                      | Load power factor correction and voltage support if needed |
| SANMATEO 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.09                 | 1.10                 | 1.04             | 1.05             | 1.02             | 1.03                               | 1.04                                  | 1.11                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| SANMATEO 230 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.02             | 1.07                 | 1.08                 | 1.03             | 1.04             | 1.02             | 1.03                               | 1.03                                  | 1.09                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| SANPAULA 115 kV | Base Case                      | P0       | Base Case            | 1.02                            | 1.04             | 1.02             | 1.10                 | 1.12                 | 1.04             | 1.06             | 1.02             | 1.03                               | 1.04                                  | 1.12                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| SANRAMON 230 kV | Base Case                      | P0       | Base Case            | 1.01                            | 1.01             | 0.98             | 1.06                 | 1.06                 | 1.01             | 1.03             | 1.00             | 1.01                               | 1.01                                  | 1.06                             | 0.97                              | 0.97                                      | Load power factor correction and voltage support if needed |
| SARATOGA 230 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.01             | 1.10                 | 1.10                 | 1.05             | 1.05             | 1.02             | 1.04                               | 1.05                                  | 1.11                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| SENER 60 kV     | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 0.98             | 1.12                 | 1.11                 | 1.06             | 1.04             | 1.01             | 1.01                               | 1.03                                  | 1.12                             | 0.98                              | 0.96                                      | Load power factor correction and voltage support if needed |
| SERRMNTE 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.11                 | 1.13                 | 1.04             | 1.06             | 1.02             | 1.04                               | 1.04                                  | 1.14                             | 1.03                              | 1.04                                      | Load power factor correction and voltage support if needed |
| SFIA 115 kV     | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.10                 | 1.11                 | 1.04             | 1.06             | 1.02             | 1.04                               | 1.04                                  | 1.12                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| SFIA-MA 115 kV  | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.09                 | 1.11                 | 1.03             | 1.05             | 1.02             | 1.03                               | 1.03                                  | 1.12                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| SHAWROAD 115 kV | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.10                 | 1.12                 | 1.04             | 1.06             | 1.02             | 1.04                               | 1.04                                  | 1.12                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |



Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation         | Contingency (All and Worst P6) | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|--------------------|--------------------------------|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                    |                                |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| SHREDDER 115 kV    | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.02             | 1.07                 | 1.08                 | 1.03             | 1.04             | 1.02             | 1.03                               | 1.04                                  | 1.08                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| SJB DG 115 kV      | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 0.99             | 1.08                 | 1.07                 | 1.04             | 1.03             | 1.01             | 1.01                               | 1.02                                  | 1.08                             | 0.99                              | 0.96                                      | Load power factor correction and voltage support if needed |
| SJB EF 115 kV      | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 0.99             | 1.08                 | 1.07                 | 1.05             | 1.03             | 1.01             | 1.01                               | 1.02                                  | 1.08                             | 0.99                              | 0.96                                      | Load power factor correction and voltage support if needed |
| SMATEO3M 115 kV    | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.02             | 1.08                 | 1.10                 | 1.04             | 1.05             | 1.02             | 1.03                               | 1.04                                  | 1.11                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| SN JSE A 115 kV    | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 0.99             | 1.08                 | 1.08                 | 1.05             | 1.03             | 1.01             | 1.01                               | 1.02                                  | 1.08                             | 0.99                              | 0.96                                      | Load power factor correction and voltage support if needed |
| SNANDRES 60 kV     | Base Case                      | P0       | Base Case            | 1.00                            | 1.07             | 1.00             | 1.14                 | 1.16                 | 1.08             | 1.10             | 0.99             | 1.04                               | 1.07                                  | 1.17                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| SNTACLRAWIND 60 kV | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.09                 | 1.09                 | 1.05             | 1.05             | 1.02             | 1.04                               | 1.05                                  | 1.09                             | 1.00                              | 0.99                                      | Load power factor correction and voltage support if needed |
| ST TRESA 115 kV    | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.03             | 1.10                 | 1.10                 | 1.07             | 1.06             | 1.04             | 1.05                               | 1.06                                  | 1.11                             | 1.03                              | 1.02                                      | Load power factor correction and voltage support if needed |
| STANFORD 60 kV     | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.02                 | 1.19                 | 1.03             | 1.04             | 1.02             | 1.05                               | 1.06                                  | 1.20                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| STATIN J 115 kV    | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.02             | 1.05                 | 1.06                 | 1.05             | 1.05             | 1.03             | 1.05                               | 1.05                                  | 1.06                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| STONE 115 kV       | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 0.99             | 1.09                 | 1.09                 | 1.06             | 1.04             | 1.01             | 1.01                               | 1.03                                  | 1.10                             | 0.99                              | 0.97                                      | Load power factor correction and voltage support if needed |
| SUNOL 60 kV        | Base Case                      | P0       | Base Case            | 1.03                            | 1.04             | 1.00             | 1.08                 | 1.08                 | 1.04             | 1.04             | 1.01             | 1.04                               | 1.04                                  | 1.08                             | 0.99                              | 0.98                                      | Load power factor correction and voltage support if needed |
| SWIFT 115 kV       | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.03             | 1.04                               | 1.05                                  | 1.10                             | 1.01                              | 1.00                                      | Load power factor correction and voltage support if needed |
| TASSAJAR 230 kV    | Base Case                      | P0       | Base Case            | 1.02                            | 1.02             | 0.99             | 1.06                 | 1.06                 | 1.03             | 1.03             | 1.01             | 1.02                               | 1.02                                  | 1.06                             | 0.99                              | 0.99                                      | Load power factor correction and voltage support if needed |
| TRAN230A 230 kV    | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.14                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| TRAN230B 230 kV    | Base Case                      | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.11                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.04                               | 1.05                                  | 1.14                             | 1.02                              | 1.03                                      | Load power factor correction and voltage support if needed |
| TRAN-60 60 kV      | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.02             | 1.09                 | 1.12                 | 1.04             | 1.05             | 1.03             | 1.04                               | 1.04                                  | 1.13                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| TRES VAQ 230 kV    | Base Case                      | P0       | Base Case            | 1.02                            | 1.03             | 1.01             | 1.06                 | 1.05                 | 1.03             | 1.03             | 1.03             | 1.02                               | 1.02                                  | 1.06                             | 1.01                              | 1.00                                      | Load power factor correction and voltage support if needed |
| TRIMBLE 115 kV     | Base Case                      | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.06                 | 1.06                 | 1.04             | 1.03             | 1.02             | 1.03                               | 1.03                                  | 1.06                             | 1.01                              | 0.98                                      | Load power factor correction and voltage support if needed |
| UNITEDSP 115 kV    | Base Case                      | P0       | Base Case            | 1.06                            | 1.06             | 1.03             | 1.10                 | 1.09                 | 1.06             | 1.06             | 1.05             | 1.06                               | 1.05                                  | 1.10                             | 1.03                              | 1.03                                      | Load power factor correction and voltage support if needed |
| UNOCAL2 115 kV     | Base Case                      | P0       | Base Case            | 1.05                            | 1.05             | 1.01             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.05                               | 1.05                                  | 1.06                             | 1.00                              | 1.01                                      | Load power factor correction and voltage support if needed |
| VALLECTS 60 kV     | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.00             | 1.08                 | 1.08                 | 1.05             | 1.04             | 1.01             | 1.04                               | 1.04                                  | 1.08                             | 0.99                              | 0.98                                      | Load power factor correction and voltage support if needed |
| VALLY VW 115 kV    | Base Case                      | P0       | Base Case            | 1.04                            | 1.04             | 1.01             | 1.06                 | 1.06                 | 1.04             | 1.04             | 1.02             | 1.04                               | 1.04                                  | 1.06                             | 1.00                              | 1.01                                      | Load power factor correction and voltage support if needed |

Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation      | Contingency (All and Worst P6)                                 | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|-----------------|--|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                 |  |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| VASCO 60 kV     | Base Case  | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.09                 | 1.09                 | 1.05             | 1.05             | 1.02             | 1.04                               | 1.05                                  | 1.09                             | 1.00                              | 0.99                                      | Load power factor correction and voltage support if needed |
| VASONA 230 kV   | Base Case  | P0       | Base Case            | 1.04                            | 1.04             | 1.01             | 1.10                 | 1.10                 | 1.05             | 1.05             | 1.02             | 1.04                               | 1.04                                  | 1.11                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| VINEYARD 60 kV  | Base Case  | P0       | Base Case            | 1.04                            | 1.05             | 1.00             | 1.08                 | 1.08                 | 1.05             | 1.05             | 1.01             | 1.04                               | 1.05                                  | 1.09                             | 0.99                              | 0.98                                      | Load power factor correction and voltage support if needed |
| W.P.BART 115 kV | Base Case  | P0       | Base Case            | 1.05                            | 1.06             | 1.03             | 1.09                 | 1.09                 | 1.06             | 1.06             | 1.04             | 1.05                               | 1.05                                  | 1.09                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| WATRSHED 60 kV  | Base Case  | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.10                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.14                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| WESTRN_D 115 kV | Base Case  | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.06                 | 1.06                 | 1.04             | 1.03             | 1.02             | 1.03                               | 1.03                                  | 1.06                             | 1.01                              | 0.99                                      | Load power factor correction and voltage support if needed |
| WHISMAN 115 kV  | Base Case  | P0       | Base Case            | 1.03                            | 1.03             | 1.01             | 1.06                 | 1.06                 | 1.03             | 1.03             | 1.02             | 1.03                               | 1.03                                  | 1.06                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| WOODSIDE 60 kV  | Base Case  | P0       | Base Case            | 1.04                            | 1.05             | 1.01             | 1.10                 | 1.14                 | 1.05             | 1.06             | 1.02             | 1.04                               | 1.05                                  | 1.15                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| WTRSHDTP 60 kV  | Base Case  | P0       | Base Case            | 1.04                            | 1.05             | 1.02             | 1.10                 | 1.13                 | 1.05             | 1.06             | 1.03             | 1.05                               | 1.05                                  | 1.14                             | 1.02                              | 1.02                                      | Load power factor correction and voltage support if needed |
| ZANKER 115 kV   | Base Case  | P0       | Base Case            | 1.02                            | 1.02             | 1.00             | 1.06                 | 1.06                 | 1.04             | 1.03             | 1.02             | 1.02                               | 1.03                                  | 1.07                             | 1.00                              | 0.97                                      | Load power factor correction and voltage support if needed |
| LOS GATS 60 kV  | MONTA VISTA-LOS GATOS 60kV                                     | P1       | N-1                  | 0.97                            | 0.97             | 0.90             | 1.16                 | 1.14                 | 1.04             | 1.02             | 0.95             | 0.96                               | 0.99                                  | 1.15                             | 0.90                              | 0.87                                      | Load power factor correction and voltage support if needed |
| MARTIN 60 kV    | MILLBRAE-SNEATH LANE 60kV                                      | P1       | N-1                  | 0.95                            | 1.18             | 0.96             | 1.25                 | 1.28                 | 1.18             | 1.20             | 0.95             | 1.18                               | 1.18                                  | 1.29                             | 0.00                              | 1.17                                      | Load power factor correction and voltage support if needed |
| PACIFICA 60 kV  | MILLBRAE-SNEATH LANE 60kV                                      | P1       | N-1                  | 0.95                            | 1.18             | 0.95             | 1.25                 | 1.28                 | 1.17             | 1.19             | 0.93             | 1.17                               | 1.18                                  | 1.29                             | 1.01                              | 1.16                                      | Load power factor correction and voltage support if needed |
| SN BRNOT 60 kV  | MILLBRAE 115/60kV TB 5   | P1       | N-1                  | 0.95                            | 1.18             | 0.94             | 1.25                 | 1.28                 | 1.17             | 1.19             | 0.92             | 1.17                               | 1.18                                  | 1.29                             | 1.01                              | 1.01                                      | Load power factor correction and voltage support if needed |
| SNTH LNE 60 kV  | MILLBRAE-SNEATH LANE 60kV                                      | P1       | N-1                  | 0.95                            | 1.18             | 0.95             | 1.25                 | 1.28                 | 1.17             | 1.19             | 0.93             | 1.17                               | 1.18                                  | 1.29                             | 1.02                              | 1.16                                      | Load power factor correction and voltage support if needed |
| FMC 115 kV      | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus           | P2       | Bus-Tie-Breaker      | 0.99                            | 0.99             | 0.96             | 1.07                 | 1.06                 | 1.03             | 1.01             | 0.99             | 0.98                               | 1.00                                  | 1.07                             | 0.95                              | 0.86                                      | Sensitivity only   |
| SJB DG 115 kV   | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus           | P2       | Bus-Tie-Breaker      | 0.99                            | 0.99             | 0.96             | 1.07                 | 1.07                 | 1.03             | 1.02             | 0.99             | 0.99                               | 1.00                                  | 1.08                             | 0.96                              | 0.88                                      | Sensitivity only   |
| SJB EF 115 kV   | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus           | P2       | Bus-Tie-Breaker      | 0.99                            | 0.99             | 0.96             | 1.07                 | 1.07                 | 1.03             | 1.02             | 1.00             | 0.99                               | 1.00                                  | 1.08                             | 0.96                              | 0.89                                      | Sensitivity only   |
| SN JSE A 115 kV | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus           | P2       | Bus-Tie-Breaker      | 1.00                            | 1.00             | 0.97             | 1.08                 | 1.07                 | 1.04             | 1.02             | 1.00             | 0.99                               | 1.00                                  | 1.08                             | 0.96                              | 0.89                                      | Sensitivity only   |
| STONE 115 kV    | NRS 400 115 kV bus tie breaker to NRS 300 115 kV bus           | P2       | Bus-Tie-Breaker      | 0.97                            | 0.97             | 0.93             | 1.08                 | 1.07                 | 1.03             | 1.01             | 0.97             | 0.96                               | 0.98                                  | 1.08                             | 0.93                              | 0.88                                      | Sensitivity only   |
| E. SHORE 230 kV | RAVENSWOOD 230 kV BAAH BUS #1 (FAILURE OF NON-REDUNDENT RELAY) | P5       | Non-Redundant Relay  | 1.02                            | 1.03             | 1.00             | 1.08                 | 1.10                 | 1.04             | 1.04             | 1.01             | 1.02                               | 1.02                                  | 1.11                             | 1.00                              | 1.00                                      | Sensitivity only   |
| JEFFERSN 230 kV | JEFFERSON 230 kV BAAH BUS #2 (FAILURE OF NON-REDUNDENT RELAY)  | P5       | Non-Redundant Relay  | 0.94                            | 1.04             | 1.01             | <1.1                 | 1.11                 | <1.1             | 1.05             | 1.03             | 1.03                               | 0.95                                  | 1.12                             | 1.01                              | 0.98                                      | Load power factor correction and voltage support if needed |

Study Area: PG&E Greater Bay Area

High/Low Voltages



| Substation      | Contingency (All and Worst P6)   | Category | Category Description | Voltage PU (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Voltage PU (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions     |
|-----------------|--|----------|----------------------|---------------------------------|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|------------------------------------|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                 |  |          |                      | 2021 Summer Peak                | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast          | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| MRT RCTR 230 kV | SAN MATEO-MARTIN 230kV & P1-4:A9:9:_MRT RCTR SVD=V                         | P6       | N-1-1                | <1.1                            | <1.1             | <1.1             | 1.14                 | <1.1                 | <1.1             | <1.1             | <1.1             | <1.1                               | <1.1                                  | <1.1                             | <1.1                              | <1.1                                      | Load power factor correction and voltage support if needed |
| NWK DIST 230 kV | P1-2:A16:18:_NEWARK E-F BUS TIE 230kV & P1-4:A18:1:_LS ESTRS SVD=R         | P6       | N-1-1                | <1.1                            | <1.1             | <1.1             | 1.10                 | <1.1                 | <1.1             | <1.1             | <1.1             | <1.1                               | <1.1                                  | 1.11                             | <1.1                              | <1.1                                      | Load power factor correction and voltage support if needed |
| VINEYARD 230 kV | VINEYARD-NEWARK 230kV & P1-4:A16:13:_VINEYARD SVD=V                        | P6       | N-1-1                | <1.1                            | <1.1             | <1.1             | 1.11                 | <1.1                 | <1.1             | <1.1             | <1.1             | <1.1                               | <1.1                                  | <1.1                             | <1.1                              | <1.1                                      | Load power factor correction and voltage support if needed |
| FMC 115 kV      | P1-2:A18:49:_LOS ESTEROS-NORTECH 115kV & P1-2:A18:19:_FMC-SAN JOSE B 115kV | P6       | N-1-1                | >0.9                            | >0.9             | >0.9             | >0.9                 | >0.9                 | >0.9             | >0.9             | >0.9             | >0.9                               | >0.9                                  | >0.9                             | >0.9                              | 0.88                                      | Sensitivity only   |
| NORTECH 115 kV  | P1-2:A21:1:_SSS-NRS 230kV (SVP) & P1-2:A18:49:_LOS ESTEROS-NORTECH 115kV   | P6       | N-1-1                | >0.9                            | >0.9             | >0.9             | >0.9                 | >0.9                 | >0.9             | >0.9             | >0.9             | >0.9                               | >0.9                                  | >0.9                             | >0.9                              | 0.88                                      | Sensitivity only   |

Study Area: PG&E Greater Bay Area

Voltage Deviation



| Substation     | Contingency (All and Worst P6) | Category | Category Description | Post Cont. Voltage Deviation % (Baseline Scenarios) |                  |                  |                      |                      |                  |                  |                  | Post Cont. Voltage Deviation % (Sensitivity Scenarios) |                                       |                                  |                                   |   | ISO Approved Projects & Potential Mitigation Solutions |
|----------------|--------------------------------|----------|----------------------|---|------------------|------------------|----------------------|----------------------|------------------|------------------|------------------|--|---------------------------------------|----------------------------------|-----------------------------------|---|--|
|                |                                |          |                      | 2021 Summer Peak                                    | 2024 Summer Peak | 2029 Summer Peak | 2021 Spring Off-Peak | 2024 Spring Off-Peak | 2021 Winter Peak | 2024 Winter Peak | 2029 Winter Peak | 2024 SP High CEC Forecast                              | 2021 SP Heavy Renewable & Min Gas Gen | 2024 SpOP Hi Renew & Min Gas Gen | 2029 Retirement of QF Generations | 2029 Summer Peak High SVP Forecasted Load |  |
| LOS GATS 60 kV | MONTA VISTA-LOS GATOS 60kV     | P1       | N-1                  | 7   | 6                | 13               | -9                   | -9                   | 0                | 2                | 7                | 7  | 4                                     | -9                               | 13                                | 16  | Disable automatic load pickup                          |
| PIERCY 115 kV  | PIERCY-METCALF 115kV           | P1       | N-1                  | 6   | 5                | 8                | 2                    | 2                    | 3                | 2                | 6                | 5  | 5                                     | 2                                | 8                                 | 9   | Sensitivity only                                       |

Study Area: PG&E Greater Bay Area

Transient Stability



| Contingency  | Category | Category Description | Transient Stability Performance |                  |                      |                           |                                  | Potential Mitigation Solutions |
|--|----------|----------------------|---------------------------------|------------------|----------------------|---------------------------|----------------------------------|--------------------------------|
|  |          |                      | Baseline Scenarios              |                  |                      | Sensitivity Scenarios     |                                  |                                |
|  |          |                      | 2024 Summer Peak                | 2029 Summer Peak | 2024 Spring Off-Peak | 2024 SP High CEC Forecast | 2024 SpOP Hi Renew & Min Gas Gen |                                |
| Metcalf 500/230 kV #13 Transformer 3Ø fault with normal clearing.  | P1-3     | N-1                  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Metcalf 500/230 kV #13 Transformer 3Ø fault with normal clearing with LMEC offline in the base case.   | P3-3     | G-1/N-1              | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Metcalf 500/230 kV #13 Transformer SLG fault with delayed clearing.  | P5-3     | Non-Redundant Relay  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Tesla-Newark 230 kV line 3Ø fault with normal clearing with Metcalf 500/230 kV #13 Transformer offline in the base case.                             | P6-1     | N-1-1                | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Metcalf 230 kV bus 3Ø fault with normal clearing with Metcalf 500/230 kV #13 Transformer offline in the base case.                                   | P6-2     | N-1-1                | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Contra Costa-Gateway 230 kV SLG fault with delayed clearing.   | P5-2     | Non-Redundant Relay  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Contra Costa-Gateway 230 kV SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time. | P4-2     | Stuck Breaker        | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| TBC SLG fault with normal clearing.  | P1-5     | N-1                  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| TBC SLG fault with normal clearing with LMEC offline in the base case.   | P3-5     | G-1/N-1              | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| TBC SLG fault with normal clearing with Tesla-Newark 230 kV line offline in the base case.   | P6-4     | N-1-1                | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Newark 230 kV 3Ø fault with normal clearing.   | P1-2     | N-1                  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Tesla-Newark 230 kV line 3Ø fault with normal clearing with LMEC offline in the base case.   | P3-2     | G-1/N-1              | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Monta Vista 230 kV SVD 3Ø fault with normal clearing.  | P1-4     | N-1                  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Monta Vista 230 kV SVD 3Ø fault with normal clearing with LMEC offline in the base case.   | P3-4     | G-1/N-1              | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Monta Vista 230 kV SVD SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.      | P4-4     | Stuck Breaker        | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Monta Vista 230 kV SVD SLG fault with delayed clearing.  | P5-4     | Non-Redundant Relay  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Ravenswood 230 kV SVD 3Ø fault with normal clearing with Monta Vista 230 kV SVD offline in the base case.  | P6-3     | N-1-1                | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Metcalf 230 kV bus SLG fault with normal clearing.   | P2-2     | Bus                  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Metcalf 230 kV line breaker SLG fault with normal clearing.  | P2-3     | Non-Bus-Tie Breaker  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Metcalf 230 kV bus-tie breaker SLG fault with normal clearing.   | P2-4     | Bus-Tie Breaker      | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |



Study Area: PG&E Greater Bay Area

Transient Stability



| Contingency   | Category | Category Description | Transient Stability Performance |                  |                      |                           |                                  | Potential Mitigation Solutions |
|---|----------|----------------------|---------------------------------|------------------|----------------------|---------------------------|----------------------------------|--------------------------------|
|   |          |                      | Baseline Scenarios              |                  |                      | Sensitivity Scenarios     |                                  |                                |
|   |          |                      | 2024 Summer Peak                | 2029 Summer Peak | 2024 Spring Off-Peak | 2024 SP High CEC Forecast | 2024 SpOP Hi Renew & Min Gas Gen |                                |
| Metcalf 500/230 kV #13 Transformer SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time. | P4-3     | Stuck Breaker        | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Crocket 3Ø fault with normal clearing with LMEC offline in the base case.   | P3-1     | G-1/N-1              | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| LMEC 3Ø fault with normal clearing.   | P1-1     | N-1                  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| DEC 3Ø fault with normal clearing.  | P1-1     | N-1                  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Metcalf 115 kV bus SVD SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.             | P4-5     | Stuck Breaker        | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Metcalf 115 kV bus-tie breaker SVD SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time. | P4-6     | Stuck Breaker        | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Metcalf 115 kV bus SLG fault with delayed clearing.   | P5-5     | Non-Redundant Relay  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Los Esteros SLG fault expanded to elements lost due to stuck breaker and clear fault from remote breakers with normal clearing time.                        | P4-1     | Stuck Breaker        | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Los Esteros SLG fault with delayed clearing.  | P5-1     | Non-Redundant Relay  | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Contra Costa-Moraga # 1 & 2 230 kV lines SLG fault with successful high speed reclose.  | P7-1     | DCTL                 | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Contra Costa-Moraga # 1 & 2 230 kV lines SLG fault with unsuccessful high speed reclose.  | P7-1     | DCTL                 | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Tesla-Newark & Tesla-Ravenswood 230 kV lines SLG fault with successful high speed reclose.  | P7-1     | DCTL                 | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |
| Tesla-Newark & Tesla-Ravenswood 230 kV lines SLG fault with unsuccessful high speed reclose.  | P7-1     | DCTL                 | No issue                        | No issue         | No issue             | No issue                  | No issue                         | No mitigation required         |

Study Area: PG&E Greater Bay Area



Single Contingency Load Drop

| Worst Contingency | Category | Category Description | Amount of Load Drop (MW) |          |          |          |          |          |          |          |          |          | Potential Mitigation Solutions |
|-------------------|----------|----------------------|--------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--------------------------------|
|                   |          |                      | Select..                 | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. |                                |
|                   |          |                      |                          |          |          |          |          |          |          |          |          |          |                                |

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

Study Area: PG&E Greater Bay Area



Single Source Substation with more than 100 MW Load

| Substation | Load Served (MW) |          |          |          |          |          |          |          |          |          | Potential Mitigation Solutions |
|------------|------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|--------------------------------|
|            | Select..         | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. | Select.. |                                |
| Kirker     | 102              | 102      | 103      |          |          |          |          |          |          |          | Mitigation under development   |