Generation Interconnection PG&E Update

April 15, 2021

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Update on 500 kV Overstressed Circuit Breaker Mitigation

Tesla and Midway 500 kV Circuit Breakers

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Background Information

- Recently concluded 2020 Reassessment and Cluster 12 & 13 studies have identified multiple transmission level circuit breakers (CBs) at Midway and Tesla 500 kV Substations stressed above their 40 kA interrupting capability

- Proposed CB mitigation have long implementation durations impacting In-Service Dates for generation projects

Midway and Tesla 500 kV CB Study Findings

- Through Cluster 13 studies, twenty 500 kV CBs at these two key substations were identified as being overstressed – fault duties are above their 40 kA interrupting capability
  - 15 at Midway
  - 5 at Tesla
- Replacing these many 500 kV CBs is complex and long-duration work
- PG&E is looking at ways to minimize the schedule impact

Substation	CB #	Nominal Voltage (kV)
Midway	712	500 kV
Midway	722	500 kV
Midway	732	500 kV
Midway	802	500 kV
Midway	832	500 kV
Midway	842	500 kV
Midway	932	500 kV
Midway	812	500 kV
Midway	822	500 kV
Midway	752	500 kV
Midway	852	500 kV
Midway	5212	500 kV
Midway	742	500 kV
Midway	902	500 kV
Midway	912	500 kV

Substation	CB #	Nominal Voltage (kV)
Tesla	542	500 kV
Tesla	612	500 kV
Tesla	622	500 kV
Tesla	632	500 kV
Tesla	642	500 kV

Evaluation of Identified Circuit Breakers

- One option being pursued by PG&E, is to work with the CB manufacturers to evaluate and verify the design of the CBs to understand if a higher rating could be used given actual design and manufacturing
- After evaluating each of the 20 CBs it has been determined that:
  - 17 CBs – qualify to change their rating to 50 kA (after a detailed inspection to ensure each CB is in good condition)
  - 1 CB – PG&E is still in conversations with the manufacturer to see if a rating change is feasible (detailed inspection is also expected to be needed)
  - 2 CBs – cannot be uprated and need replacement (manufacturer no longer in business)

Summary of Current Status

Substation	CB #	Nominal Voltage (kV)	Inspection status	Qualifies for 50 kA?
Midway	712	500 kV	2021-2022?	Pending Inspection
Midway	722	500 kV	2021-2022?	Pending Inspection
Midway	732	500 kV	2021-2022?	Pending Inspection
Midway	802	500 kV	2021-2022?	Pending Inspection
Midway	832	500 kV	2021-2022?	Pending Inspection
Midway	842	500 kV	2021-2022?	Pending Inspection
Midway	932	500 kV	2021-2022?	Pending Inspection
Midway	812	500 kV	Complete	Yes
Midway	822	500 kV	Complete	Yes
Midway	752	500 kV	Complete	Yes
Midway	852	500 kV	Complete	Yes
Midway	5212	500 kV	Complete	Yes
Midway	742	500 kV	Complete	Yes
Midway	902	500 kV	Complete	Yes
Midway	912	500 kV	Complete	Yes
Tesla	542	500 kV		**No. CB replacement Needed**
Tesla	612	500 kV		**No. CB replacement Needed**
Tesla	622	500 kV	Complete	Yes
Tesla	632	500 kV	2021	Pending Inspection
Tesla	642	500 kV	TBD	Pending Manufacturer's Confirmation and Inspection

- 17 CBs that qualify for rating change:
  - 9 CBs (8 at Midway, 1 at Tesla) can already become 50 kA, pending few activities to change ratings (such as nameplate, records, rating register, etc.)
  - 8 CBs (7 at Midway, 1 at Tesla) qualify to become 50 kA, pending detailed inspections to confirm condition
- 1 CB (at Tesla) – PG&E expects manufacturer's determination soon (inspection also expected to be needed)
- 2 CBs (at Tesla) need replacement – PG&E expects to have detailed schedule in next few weeks

500 kV CB Inspection Details

- Inspections for circuit breakers eligible to increase to 50 kA
  - Inspections take approximately 3 weeks per breaker
  - Each CB is opened, inspected for aging and interrupter components are tested
  - If inspection and testing is passed CB can get an uprate from 40 kA to 50 kA
- Schedule
  - Annual CB inspection schedule is carefully planned and coordinated
  - 2021 inspection plan is already set with clearances already evaluated by PG&E and CAISO operators. Inspection clearances are not all standalone clearances and were bundled with existing long term 500 kV clearances.
  - Schedule is driven by availability of limited specially trained substation electricians available to execute the work (limited qualified electricians exist)
  - Long lead time mechanisms and interrupters have been ordered and delivered for the 2021 work
  - Inspections for identified CBs that cannot be accommodated in 2021 will be prioritized for 2022
- Inspection Passed
  - Administrative updates, order and replace new nameplate from manufacturer, update SAP records, CAISO Transmission Register
  - Until the higher ratings are official, this list will be used to assess impact of overstressed breakers on the queue projects' COD in subsequent study processes

Reconductoring Projects Status Update

Projects Supporting FCDS

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PG&E Projects Status Summary

Project No.	T-Line Scope	Status	Sequence	Planned Const. Start	Planned In-Service
Cluster 8 - Project 1	Reconductor **Quinto SS – Los Banos 230kV Line**	Engineering nearing completion Now: Finalizing Design Next Step: Procurements	First on Deck	Q1-2022*	Q2-2022
Cluster 8 - Project 2	Reconductor **Los Banos – Padre Flat SS 230kV Line**	Engineering 25% Complete Now: Reviewing Land Right Plan Next Step: Resuming Design	After Project 1	Q4-2022*	Q1-2023**
Cluster 8 - Project 3	Reconductor **Padre Flat SS – Panoche #1 230 kV Line**	Engineering 25% Complete Now: Reviewing Land Right Plan Next Step: Resuming Design	After Project 2	Q1-2023*	Q2-2024**
Cluster 8 - Project 4	Reconductor **Dos Amigos PP – Panoche 230kV Line**	Engineering 25% Complete Now: Reviewing Land Right Plan Next Step: Resuming Design	After Project 3	Q3-2024*	Q2-2025**
BW	Reconductor **Bellota-Warnerville 230kV Line** **Bellota-Cottle 230kV Line**	NOC Received: 3/9/21 Now: Finalizing Engineering Next Step: Procurements and Land Rights	First On Deck	Summer 2022*	BW Line: April 2023** BC Line: April 2024**
Cluster 8 - Project 5	Replace Structures & Reconductor **Borden-Gregg 230kV Line # 1** **Borden-Gregg 230kV Line # 2**	Engineering nearing 60% Now: Alternative Design Review Next steps: CPUC Permit planning	After BW or construct in the off-season using alternative design	2022-2023*	Line #1: 2024 ** Line #2: 2023 **

* Construction start is dependent on design strategy, CPUC permitting strategy, obtaining necessary land / aerial rights, clearance sequence, obtaining necessary construction easements, and access to structures

** In-Service Date is subject to change through the design process as more information becomes available.

Additional Details

- **Bellota-Warnerville 230kV Line**
  - Advice Letter received for NOC on 3/9/21.
  - Next up 2021: Finalize engineering, order long-lead materials (LLMs) such as poles and conductor, begin land rights process
  - Winter-Spring 2022: Preconstruction Activities including Receive materials, acquire land rights
  - Summer 2022: Construction Start
  - Phase 1 (Bellota-Warnerville circuit) goes operational in Spring of 2023
  - Phase 2 (Bellota-Cottle circuit) goes operational in Spring of 2024

- **Borden–Gregg 230kV Lines #1 and #2**
  - Nearing 60% design
  - Existing ROW (Right-of-Way) is insufficient
  - New rights expected to construct through mostly row crops and one commercially planned development area.
  - Next Up in 2021: Currently analyzing alternative design strategies to optimize final in-service date including:
    - Permitting strategy and possible CPUC exemptions
    - Avoiding clearance constraints and conflicts through modified design (parallel alignment, reroute, shoofly etc.)
  - Planned in-service date TBD based on outcome of design, CPUC permitting, and land / areal rights and land acquisitions.
  - Phase 1 (Borden-Gregg #2)
  - Phase 2 (Borden-Gregg #1)