PG&E’s 2020 Request Window Proposals

CAISO 2020-2021 Transmission Planning Process

September 24, 2020
Transmission Project Proposals Overview

Five Projects Seeking CAISO Approval:

Stockton
- Manteca #1 60 kV Line Section Reconductoring (Reliability Driven)
- Kasson-Kasson Junction #1 115kV Line Section Reconductoring (Reliability Driven)

North Valley
- Palermo-Wyandotte 115kV Line Section Reconductoring (Reliability Driven)

Greater Bay Area
- Metcalf 500/230 kV Transformers Dynamic Series Reactor Project (Reliability and Economic Driven)
- Santa Teresa 115 kV Substation Project (Load Interconnection Driven)
MANTECA #1 60 KV LINE SECTION RECONDUCTORING
Area Background

- 26 MW load in this pocket served by radial transmission line, mostly at Westley Sub
- Kasson Sub is the primary source for summer
- Manteca Sub is one alternate source, and Salado – Newman #2 line is another
Assessment Results

- **Contingency Description:**
  - **P0:** Normal thermal overload on 1.13 miles of Manteca #1 60 kV Line (Manteca Jct. to Banta Carbona)

- **Power Flow Results:**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Pre-Project</th>
<th>Post-Project</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manteca #1 60 kV Line From 009/147 Manteca Junction (MNTCA JT) To 010/158</td>
<td>Rating* &amp; Length: 297 Amps 0.80 mile</td>
<td>2022: 98.9% 2025: 97.8% 2030: 90.0%</td>
<td>2025: 66% Category: P0 Contingency Name: None</td>
</tr>
<tr>
<td>Manteca #1 60 kV Line From 010/158 To 010/165 Banta Carbona Tap (BNTA CRB)</td>
<td>Rating* &amp; Length: 243 Amps 0.33 mile</td>
<td>2022: 120.8% 2025: 119.5% 2030: 108.1%</td>
<td>2025: None Category: None Contingency Name: None</td>
</tr>
</tbody>
</table>

*Existing Summer Normal Rating*
Proposed Project

- **Project Objectives:** Increase Manteca #1 60 kV line capacity to address NERC TPL-001-4 P0 thermal overload issue

- **Preferred Scope**
  - Reconductor ~1.13 circuit miles between Manteca Jct (009/147) and Banta Carbona Tap (010/165) on the Manteca #1 60 kV Line with larger conductor to achieve at least 368 Amps of summer normal rating, as shown in the table below
  - Remove any limiting components as necessary to achieve full conductor capacity

<table>
<thead>
<tr>
<th>Line Section</th>
<th>Conductor Type and Size</th>
<th>Length (miles)</th>
<th>Official Line Section Ratings (Amps, Summer Normal)</th>
<th>Minimum Required Normal Rating (Amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 009/147 Manteca Junction (MNTCA JT) To 010/158</td>
<td>4/0 Al</td>
<td>0.80</td>
<td>297</td>
<td>368</td>
</tr>
<tr>
<td>From 010/158 To 010/165 Banta Carbona Tap (BNTA CRB)</td>
<td>1/0 Cu</td>
<td>0.33</td>
<td>243</td>
<td></td>
</tr>
</tbody>
</table>
**Proposed Project (cont.)**

- **Proposed In-Service Date**
  May 2024 or earlier

- **Estimated Cost**
  $1.4M-$2.8M*

*AACE Level 5 quality estimates includes a +100% contingency
• **Other Alternatives Considered**

  – Rerate: is not feasible per PG&E re-rate methodology as the line overloads can occur outside of the allowed rerate time period of 10 AM to 7 PM

  – 10 MVAR Capacitor Bank at Westley: attempts to improve the power factor at the Westley 60 kV bus, is not adequate to fully resolve the violation due to the magnitude of the overload

  – Energy storage:
    - is not feasible within the substation due to space limitation
    - is not as cost-effective as a short reconductoring project
KASSON-KASSON JUNCTION 1
115 KV LINE SECTION
RECONDUCTORING
Area Background

- Two parallel 115 kV lines deliver power from Tesla Substation and Tracy GWF co-gen plant to supply the City of Tracy and City of Manteca areas
  - Schulte-Kasson-Manteca 115 kV line
  - Schulte-Lammers 115 kV line + Lammers-Kasson 115 kV line
- Other main sources that supply this area include the Tesla-Tracy 115 kV line, and generations east of Manteca
• **Contingency Description:**
  
  – Under P1 contingency of Schulte-Lammers 115 kV line, overload of up to 127% is observed on the other parallel line between the Kasson to Kasson Junction 1 section (0.08 circuit mile)

• **Power Flow Results**
  
  – Vierra 115 kV Looping Project expansion project (expected in service 2023) will help reduce the overloads but won’t eliminate them
  
  – Marginal overload of up to 104% is observed on the upper stream section of this line from Schulte Switching Station to Kasson Junction 1. Recommended to monitor and re-evaluate in future cycles.

<table>
<thead>
<tr>
<th>Stockton Peak</th>
<th>Pre-Project</th>
<th>Post-Project</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility</td>
<td>Rating* (Amps)</td>
<td>2022</td>
<td>2025</td>
</tr>
<tr>
<td>Kasson-Kasson Junction 1</td>
<td>742</td>
<td>127%</td>
<td>103%</td>
</tr>
</tbody>
</table>

*Existing Summer Emergency Rating*
Proposed Project

- **Project Objectives:** Increase Schulte-Kasson-Manteca 115 kV line capacity to address NERC TPL-001-4 P1 thermal overload issue.

- **Preferred Scope:** meet planning criteria and reliability standard, and enhance operating flexibility
  - Reconductor the Kasson-Kasson Junction 1 section (approx. 0.08 circuit miles) to at minimum 477 ACSS that matches the remaining sections of this line.
  - Replace structures, if necessary.
Proposed Project (cont.)

- **Proposed In-Service Date:**
  - May 2023 or earlier

- **Estimated Cost:**
  - $250K-$500K*

- **Other Alternatives Considered**
  - Status Quo: does not mitigate the P1 issues
  - Rerate: is not feasible per PG&E re-rate methodology as the line overloads can occur outside of the allowed rerate time period of 10 AM to 7 PM

*AACE Level 5 quality estimates includes a +100% contingency*
PALERMO-WYANDOTTE 115 KV LINE SECTION RECONDUCTORING
Wyandotte 115 kV substation is located in Butte County, North Valley division and serves about 16,300 customers.

The original design of the substation is a primary feed from Palermo-Wyandotte 115 kV line, with a backup feed from the Caribou-Palermo 115 kV line.

The Caribou-Palermo line has been de-energized since 2018.

Currently, Wyandotte substation is fed from a single transmission line (Palermo-Wyandotte 115 kV Line).
Assessment Results

- **Contingency Description:**
  
P0: Normal Overload on 0.05 circuit miles between Pole 003/025 and Wyandotte Substation of the Palermo-Wyandotte 115 kV line

- **Power Flow Results:**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Rating* (Amps)</th>
<th>Pre-Project</th>
<th>Post-Project</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palermo – Wyandotte 115 kV Line (003/025-Wyandotte)</td>
<td>325</td>
<td>2022</td>
<td>106%</td>
<td>104%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2025</td>
<td>56%</td>
<td>P0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2030</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Existing Summer Normal Rating
Proposed Project

- **Project Objectives:** Increase Palermo-Wyandotte 115 kV line capacity to address NERC TPL-001-4 P0 thermal overload issue

- **Preferred Scope:**
  - Reconductor ~0.05 circuit miles between Pole 003/025 and Wyandotte Substation on the Palermo-Wyandotte 115 kV line with larger conductor to achieve at least 631 Amps of summer normal rating to match the remaining section of the line (preferably 715.5-37 AAC conductor)
  - Remove any limiting components to achieve the full conductor capacity

<table>
<thead>
<tr>
<th>Line section</th>
<th>Conductor size and type</th>
<th>Length (miles)</th>
<th>Official line section ratings (Amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Palermo To 001/011</td>
<td>715.5-37 AAC</td>
<td>1.64</td>
<td>N 631</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E 742</td>
</tr>
<tr>
<td>FROM 001/011 TO 003/025</td>
<td>336.4-30/7 ACSR</td>
<td>1.77</td>
<td>N 449</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E 512</td>
</tr>
<tr>
<td>FROM 003/025 TO Wyandotte</td>
<td>3/0-7 CU</td>
<td>0.05</td>
<td>N 325</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E 377</td>
</tr>
</tbody>
</table>
• **Proposed In-Service Date:**
  – May 2023 or earlier

• **Estimated Cost:**
  – $125K-$250K*

• **Other Alternatives Considered:**
  – **Status Quo**: does not mitigate the P0 issues.
  – **Rerate**: is not feasible per PG&E re-rate methodology as the line overloads occur outside of the allowed rerate time period of 10 AM to 7 PM

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*AACE Level 5 quality estimates includes a +100% contingency*
METCALF 500/230 KV TRANSFORMERS DYNAMIC SERIES REACTOR PROJECT
Area Background

- Metcalf Substation is in the City of San Jose in the Greater Bay Area (GBA)
- It serves as one of the major 500 kV sources of power supply to the GBA
- It connects to the bulk 500 kV system via the Tesla – Metcalf, Moss Landing – Metcalf, and Moss Landing – Los Banos 500 kV lines
- Metcalf transfers power from bulk system to 230 kV system via three 500/230 kV transformers and serves majority of the South Bay area and Peninsula via 230kV and 115 kV lines
• **Contingency Description:**

P6 T-1-1 Outage:

A loss of two of the three 500/230 kV transformers at Metcalf Substation will overload the third 500/230 kV transformer

• **Power Flow Results:**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Facility Rating (MVA)</th>
<th>2022 Spring Off-Peak</th>
<th>2022 Spring Off-Peak</th>
<th>Category</th>
<th>Contingency Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metcalf 500/230 kV Transformer NO.13</td>
<td>1122 MVA</td>
<td>128.2%</td>
<td>94.9%*</td>
<td>P6</td>
<td>P6: Metcalf 500/230 kV Transformers No.11 and No. 12</td>
</tr>
</tbody>
</table>

* With this project and generation dispatch
**Local Capacity Requirement**

- **Local Capacity Technical Study (LCT) Results:**

CAISO’s 2021 LCT Study identified the GBA LCR need was driven by a T-1-1 limiting constraint, which is the loss of any two of the three 500/230 kV transformers at Metcalf Substation would trigger the overload on the remaining third transformer.

<table>
<thead>
<tr>
<th>Year</th>
<th>Category</th>
<th>Limiting Facility</th>
<th>Contingency</th>
<th>Final GBA LCR (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>P6</td>
<td>Metcalf 500/230 kV Transformer No. 13</td>
<td>P6: Metcalf 500/230 kV Transformer No. 11 &amp; No. 12</td>
<td>6353 5100</td>
</tr>
</tbody>
</table>
Proposed Project

- **Project Objectives:**
  - Address identified P6 T-1-1 reliability concerns as well as to reduce reliance on local GBA generation

- **Preferred Scope:**
  - Install Smart Valves in series with the three 500/230 kV transformers on the low voltage side at Metcalf Substation
  - Install bypass circuits to the Smart Valves for maintenance

- **Proposed In Service Date:**
  - May 2024 or earlier

- **Estimated Cost:**
  - $22M- $32M*

* AACE Level 4 quality estimates includes a +50% contingency
Other Alternatives Considered:

- **Status Quo**
  
  Not recommended due to the expected cost incurred by the additional generation procurement for GBA LCR

- **Install Series Reactors (2ohm per bank) on all Metcalf 500/230 kV banks and RAS**
  
  Not recommended. More expensive. Total cost (AACE Class 4): $42.8M

- **Install Smart Valves on Tesla-Metcalf 500 kV and Moss Landing – Metcalf 500 kV lines (13 ohm per line) and RAS**
  
  Not recommended. Not enough space, less effective and much more expensive.

- **Install series reactors on Tesla-Metcalf 500 kV and Moss Landing – Metcalf 500 kV lines (13 ohm per line) and RAS**
  
  Not recommended. Not enough space, less effective and much more expensive.
SANTA TERESA 115 KV SUBSTATION PROJECT
• Edenvale Substation is connected to the Metcalf-Edenvale 115 kV No.1 & No.2 Lines and serves over 38,000 industrial, commercial, data center and residential customers with 120 MW of load

• The need for Santa Teresa 115/21 kV Substation was driven by new data center loads requesting to be interconnected to PG&E’s distribution system

• Santa Teresa Substation will be looped of the Metcalf-Edenvale No.1 115 kV line

• In 2021, when the new station becomes operational, the projected load served at Santa Teresa Substation is 25 MW
Assessment Results

- **Power flow results**
  - No additional transmission upgrades were identified to accommodate the transfer of existing distribution connected customer load and planned data center load increase at Santa Teresa Substation.
  
  - Transmission system impacts to connect load increase of existing data center loads and large load additions at Santa Teresa Substation will be studied upon receiving the customer’s load application.

<table>
<thead>
<tr>
<th>Monitored Facility Name</th>
<th>Facility Rating (Amps)</th>
<th>Pre-Project</th>
<th>Post Project</th>
<th>Contingency Category</th>
<th>Contingency Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metcalf – Edenvale No.1 115 kV Line</td>
<td>1200</td>
<td>30%</td>
<td>33%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metcalf – Santa Teresa 115 kV Line</td>
<td>1400</td>
<td></td>
<td>33%</td>
<td>P0</td>
<td>None</td>
</tr>
<tr>
<td>Santa – Teresa – Edenvale 115 kV Line</td>
<td>1400</td>
<td></td>
<td>24%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metcalf – Edenvale No.2 115 kV Line</td>
<td>1200</td>
<td>33%</td>
<td>33%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Project Objectives:

- New Santa Teresa Substation will provide the distribution capacity to serve existing and three new distribution data center load customers.
- Additionally, the substation will improve service reliability and operating flexibility in the South San Jose area.
• **Project Scope:** Located on PG&E property at Edenvale Service Center in San Jose
  
  – New four-element 115 kV ring bus
  
  – One 45 MVA 115/21 kV distribution bank,
  
  – Two 21 kV distribution circuits
  
  – Loop in Metcalf-Edenvale No.1 115 kV line into the Santa Teresa substation.
  
  – Ultimate - (3) 45 MVA Banks, 12 circuits

• **Proposed In-Service Date:**
  
  – June 2021

• **Estimated Cost:**
  
  – $6M-$9M (Transmission portion cost)
Proposed Project (cont.)

• Other Alternatives Considered
  – At Edenvale 115 kV Substation – Install two new feeders and replace three 115/21 kV 45 MVA transformers 60 MVA transformers

*Not recommended. 60 MVA transformers are non-standard and there are no 60 MVA mobile transformers available in case of a transformer failure*