

# PG&E's 2022 Request Window Proposals

CAISO 2022-2023 Transmission Planning Process

**September 28, 2022**



Together, Building  
a Better California



# Transmission Project Proposals Overview

## Eight Reliability Driven Projects Seeking CAISO Approval:

### **Greater Bay Area**

- Metcalf 230/115 kV Transformers CB Addition
- South Bay Area Limiting Elements Upgrade
- Redwood City Area Reinforcement Project

### **Humboldt**

- Garberville Area Reinforcement Project

### **Stockton**

- Tesla 115 kV Bus Reconfiguration

### **Sacramento**

- Cortina #1 60 kV Line Reconductoring Project

### **Greater Fresno Area**

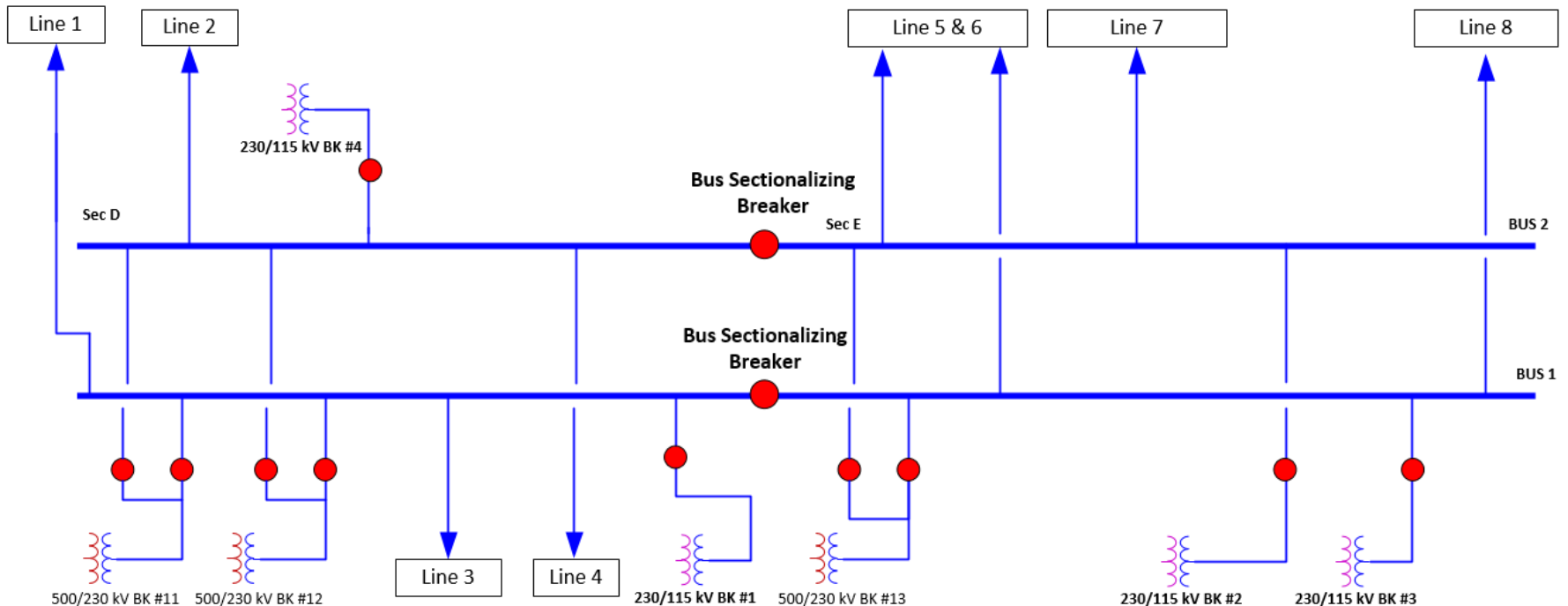
- Los Banos 70 kV Area Reinforcement Project

### **Kern**

- North-East Kern 115 kV Reconductoring Project

# **METCALF 230/115 kV TRANSFORMERS CB ADDITION PROJECT**

- Metcalf Substation is in the Santa Clara County. There are four 230/115 kV transformers at Metcalf that could transfer over 1600 MVA of power to the 115 kV system to serve the load in South Bay Area .
- Metcalf 230 kV has two sectionalizing breakers that splits the bus into two sections, D and E.





# Assessment Results

- Contingency Description:**

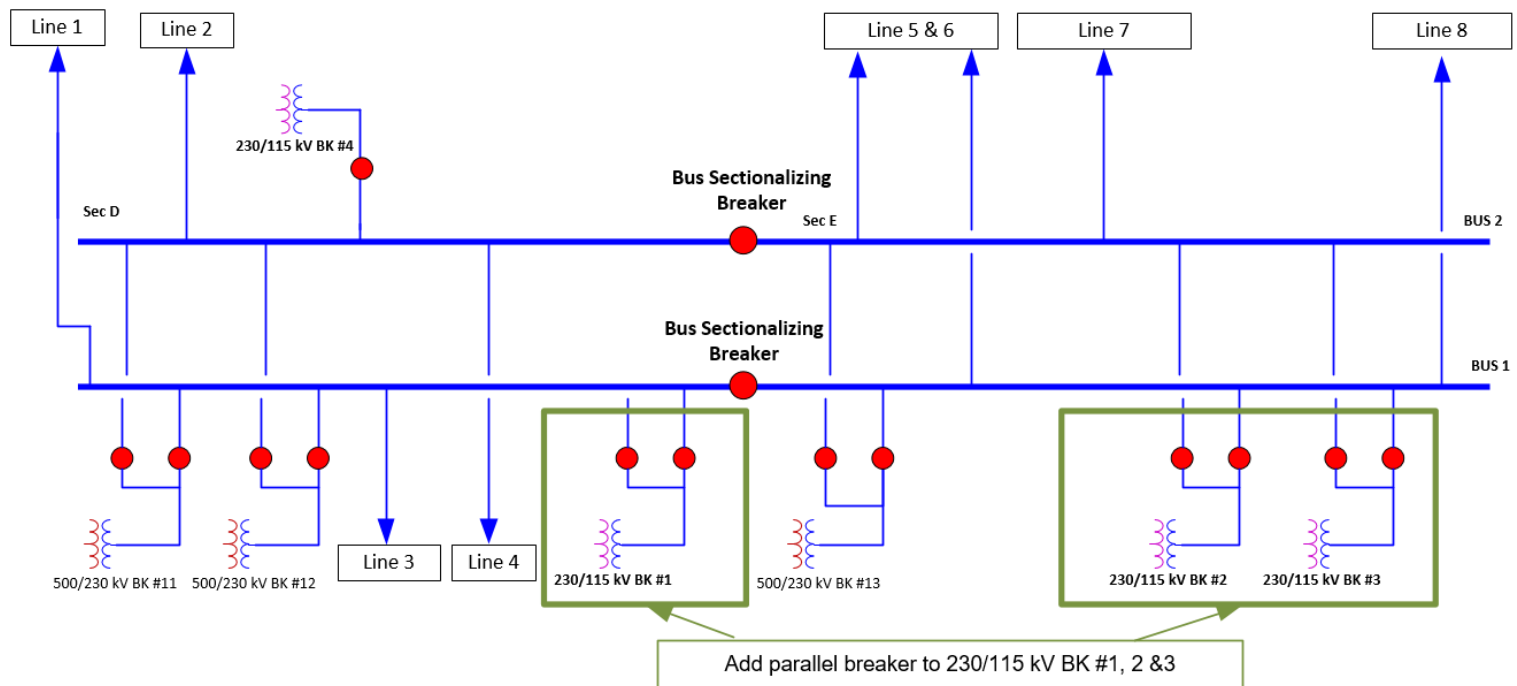
**P2-4** : Internal breaker fault on bus sectionalizing breaker that results in the loss of two 230/115 kV transformers and overloading the two remaining transformers

- Power Flow Results:**

GRBA Summer Peak		Pre-Project			Post-Project	Contingency	
Facility	Rating (Amps)	2024	2027	2032	2027	Category	Contingency Name
Metcalf 230/115 kV Transformer No. 1	443(SE)	115.1%	119.5%	109.2%	85%	P2	METCALF 230KV - SECTION 2D & 2E
Metcalf 230/115 kV Transformer No. 2	443 (SE)	109.2%	111%	103.1%	<70%	P2	METCALF 230KV - SECTION 1D & 1E
Metcalf 230/115 kV Transformer No. 3	443 (SE)	114.2%	118.7%	108.5%	85%	P2	METCALF 230KV - SECTION 2D & 2E
Metcalf 230/115 kV Transformer No. 4	462 (SE)	110%	111.6%	103.6%	<70%	P2	METCALF 230KV - SECTION 1D & 1E

# Proposed Project

- **Project Objectives:** Make three Metcalf 230/115 kV transformer banks to connect to both Metcalf 230 kV Bus 1 and Bus 2 by adding parallel breakers to address NERC TPL-001-5 P2 thermal overload issue.
- **Preferred Scope**
  - Add parallel breakers (similar to the 500/230 kV banks connections at Metcalf) to each of the 230/115 kV banks Nos. 1, 2, and 3 at Metcalf 230 kV Substation.





# Proposed Project (cont.)

- **Proposed In-Service Date**

May 2029 or earlier

- **Estimated Cost**

\$7.5M - \$15M \*

- **Other Alternatives Considered**

- Alternative 1: Add two sectionalizing breakers at Metcalf 230 kV

This alternative is not recommended because it is not feasible due to space limitation at Metcalf substation.

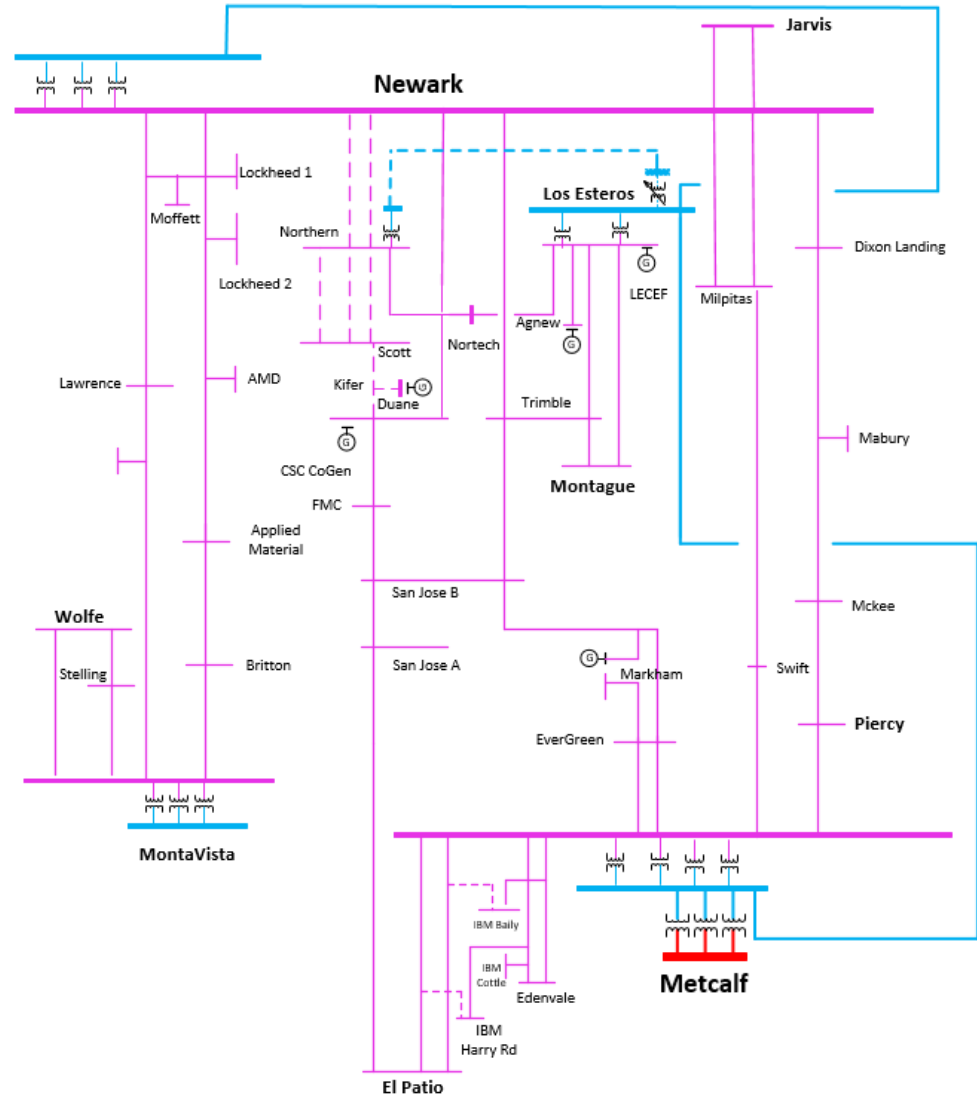
- Alternative 2: Convert Metcalf 230 kV to Breaker and Half Configuration

This alternative addresses the NERC violations, but it is not recommended because the cost is much higher in comparison to the recommended scope.

# **SOUTH BAY AREA LIMITING ELEMENTS UPGRADE PROJECT**



- The South Bay sub-area covers approximately 1,500 square miles and is composed of cities in Santa Clara County.
- The major cities in the sub-area are San Jose, Mountain View, Morgan Hill and Gilroy. Los Esteros, Metcalf, Monta Vista and Newark are the key electric substations that deliver power into the sub-area.
- The South Bay Area encompasses the De Anza Division, San Jose Division and the City of Santa Clara (Silicon Valley Power or SVP).





# Assessment Results

- **Contingency Description:**

- **P0:** Normal thermal overload on Metcalf-Piercy 115 kV
- **P1:** Single contingency thermal overload on three 115 kV lines
- **P6:** Multiple contingency thermal overload on Los Esteros- Montague 115 kV

- **Power Flow Results:**

GRBA Area Summer Peak		Pre-Project			Post-Project	Contingency	
Facility	Rating (A)	2024	2027	2032	2027	Category	Contingency Name
MONTA VISTA-WOLFE 115 kV	802 (SE)	116.4%	126.2%	142.9%	91.6%	P1	STELLING-MONTA VISTA 115 KV
NEWARK-JARVIS #1 115 kV	600 (SE)	98%	100.6%	114.6%	75%	P1	NEWARK-JARVIS #2 115 kV
METCALF-PIERCY 115 kV	702 (SN)	116.3%	126.7%	<70%	88%	P0	Base Case
METCALF-EL PATIO #1 115 kV	802 (SE)	101.1%	117.2%	76.3%	82%	P1	METCALF-EL PATIO #2 115 KV
LOS ESTEROS-MONTAGUE 115 kV	1000 (SE)	116.4%	122.9%	101.8%	80%	P6	LOS ESTEROS-TRIMBLE 115 KV & LOS ESTEROS-NORTECH 115 KV



# Proposed Project

- **Project Objectives:** Upgrade the limiting elements to address NERC TPL-001-5, P0, P1 and P6 thermal overload issue
- **Preferred Scope**

The project scope is to upgrade any limiting elements on the following five lines in the South Bay Area to achieve full conductor rating:

- 1) Monta Vista –Wolfe 115 kV Line (Estimated Cost: \$2.0M - \$4.0M\*)
- 2) Newark –Jarvis #1 115 kV Line (Estimated Cost: \$0.2M - \$0.4M\*)
- 3) Metcalf-Piercy 115 kV Line (Estimated Cost: \$1.0M - \$2.0M\*)
- 4) Metcalf-El Patio#1 115 kV Line (Estimated Cost: \$0.3M - \$0.6M\*)
- 5) Los Esteros-Montague 115 kV Line (Estimated Cost: \$2.0M - \$4.0M\*)

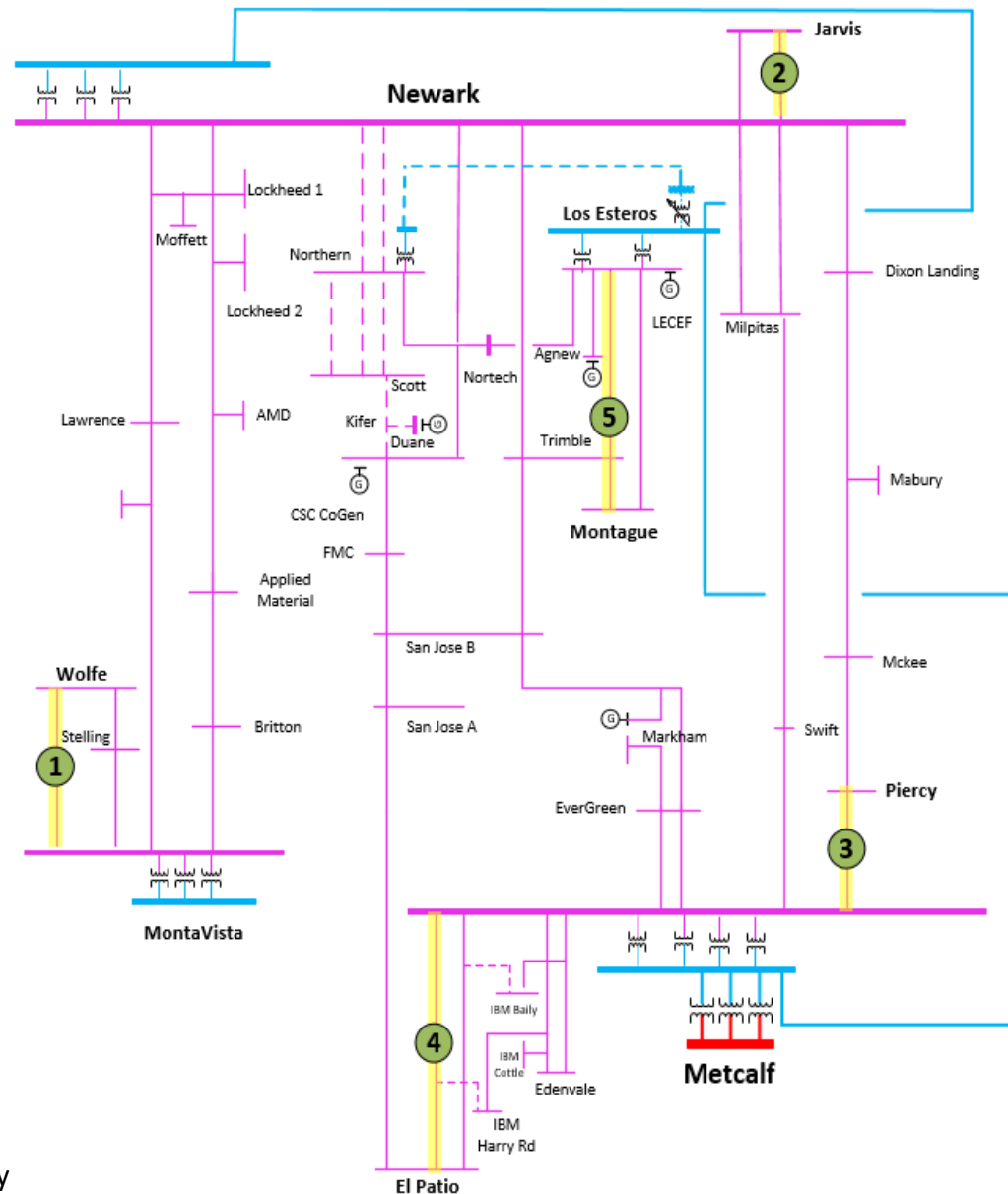
\*AACE Level 5 quality estimates includes a +100% contingency



# Proposed Project (cont.)

- **Proposed In-Service Date**  
May 2027 or earlier
- **Estimated Cost**  
\$5.5M - \$11.0M \*
- **Other Alternatives Considered**

No other alternatives could be as cost-effective as the proposed scope to increase the load serving capability in the South Bay Area 115 kV system.



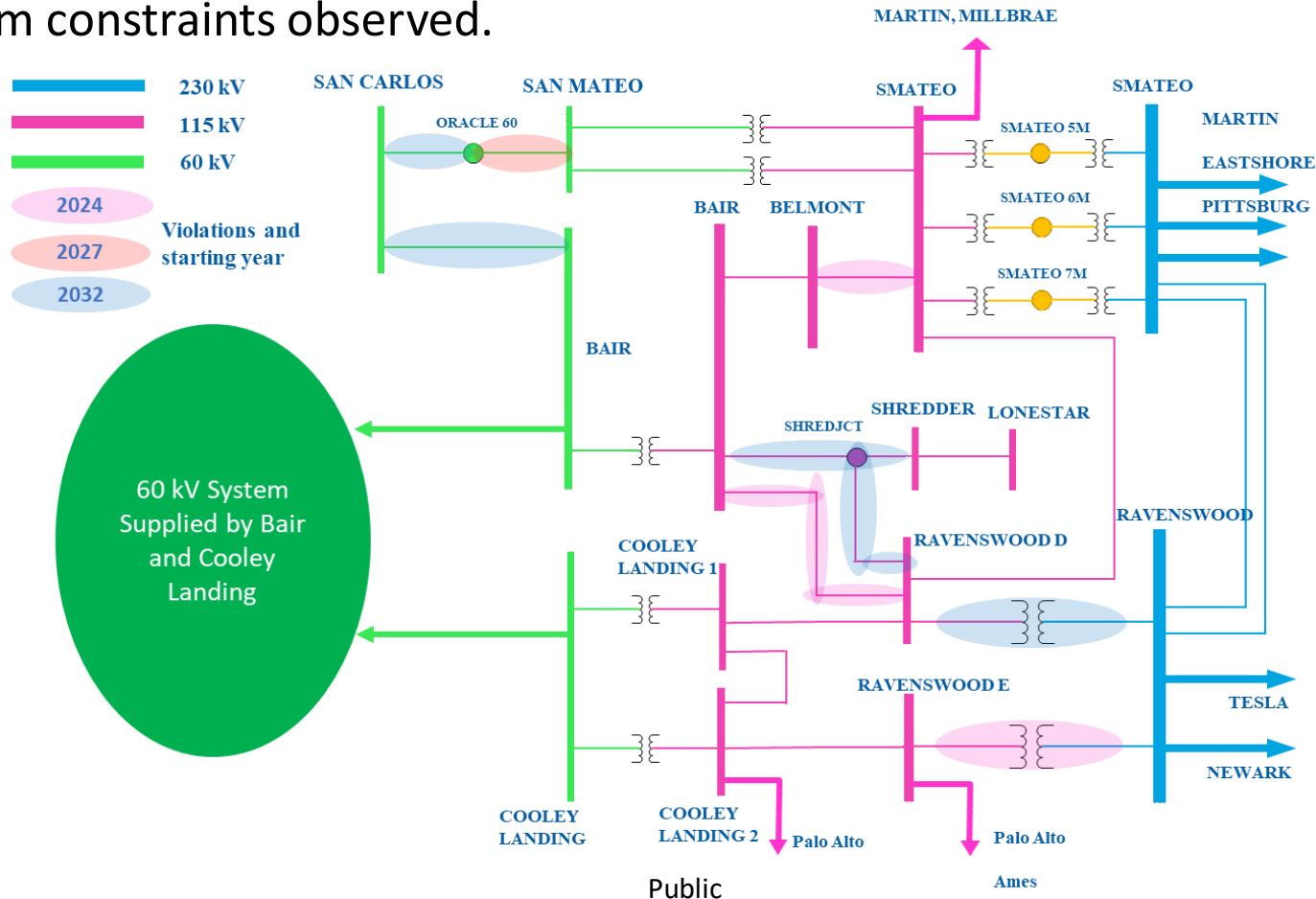
\*AACE Level 5 quality estimates includes a +100% contingency

# REDWOOD CITY AREA 115 kV SYSTEM REINFORCEMENT



# Area Background

- San Mateo and Ravenswood 230 kV sources supply this area through multiple 115 kV lines to Bair and Cooley Landing, and then to local 60 kV systems.
  - Three 115 kV corridors supply into Bair from San Mateo and Ravenswood.
- Rapid load growth in the Redwood City and Menlo Park area; transmission system constraints observed.



- **Contingency Description**
  - Upon losing two out of the three 115 kV corridors supplying into Bair under NERC P7 or P6 contingencies, the remaining corridor gets overloaded.
  - Upon losing both the two 230/115 kV transformers at Ravenswood under NERC P6 contingencies, the San Mateo to Bair 115kV and 60 kV lines are overloaded.
  - In the long term, the 230/115 kV transformers at Ravenswood will be overloaded under many P6 events that include the outage of one of the Ravenswood transformers. In addition, under P1 contingency that loses one Ravenswood transformer, the other one will be loaded close to its capacity.



# Assessment Results

## Power Flow Results

Greater Bay Area Summer Peak		Pre-Project Loading (%)			Post-Project Loading (%)	Contingency
Facility	Summer Emergency Rating	2024	2027	2032	2032	
San Mateo - Belmont 115 kV Line	556 Amp	112	115	129	62	P7-1: Ravenswood - Bair 115 kV Line #1 and #2
		120	128	144	40	
San Mateo - Bair 60 kV Line San Mateo - Oracle Section	557 Amp	98	104	111	71	P6: RAVENSWD 230/115 kV Transformer #1 and #2
San Mateo - Bair 60 kV Oracle to San Carlos Section	499 Amp	92	99	106	63	
Ravenswood - Bair 115 kV Line #1	617 Amp	117	119	135	74	P6: San Mateo - Belmont 115 kV Line and Ravenswood - Bair 115 kV Line #2
Ravenswood 230/115 kV Transformer #1	2024: 398 MVA* 2027/2032: 490 MVA	Up to 109*	Up to 93	Up to 105	Up to 77% under all the contingencies except:  97% under P6 events that lose two out of three Ravenswood transformers	P1, P3, P6 that include Ravenswood 230/115 kV Transformer #2
Ravenswood 230/115 kV Transformer #1 or #2	460 MVA	Up to 94	Up to 97	Up to 108		Long-term only overload: P1, P3 and P6 events that includes one Ravenswood transformer

\* There is an approved CAISO project Ravenswood 230/115 kV Transformer #1 Limiting Facility Upgrade that will enhance rating and address the overload until long-term.



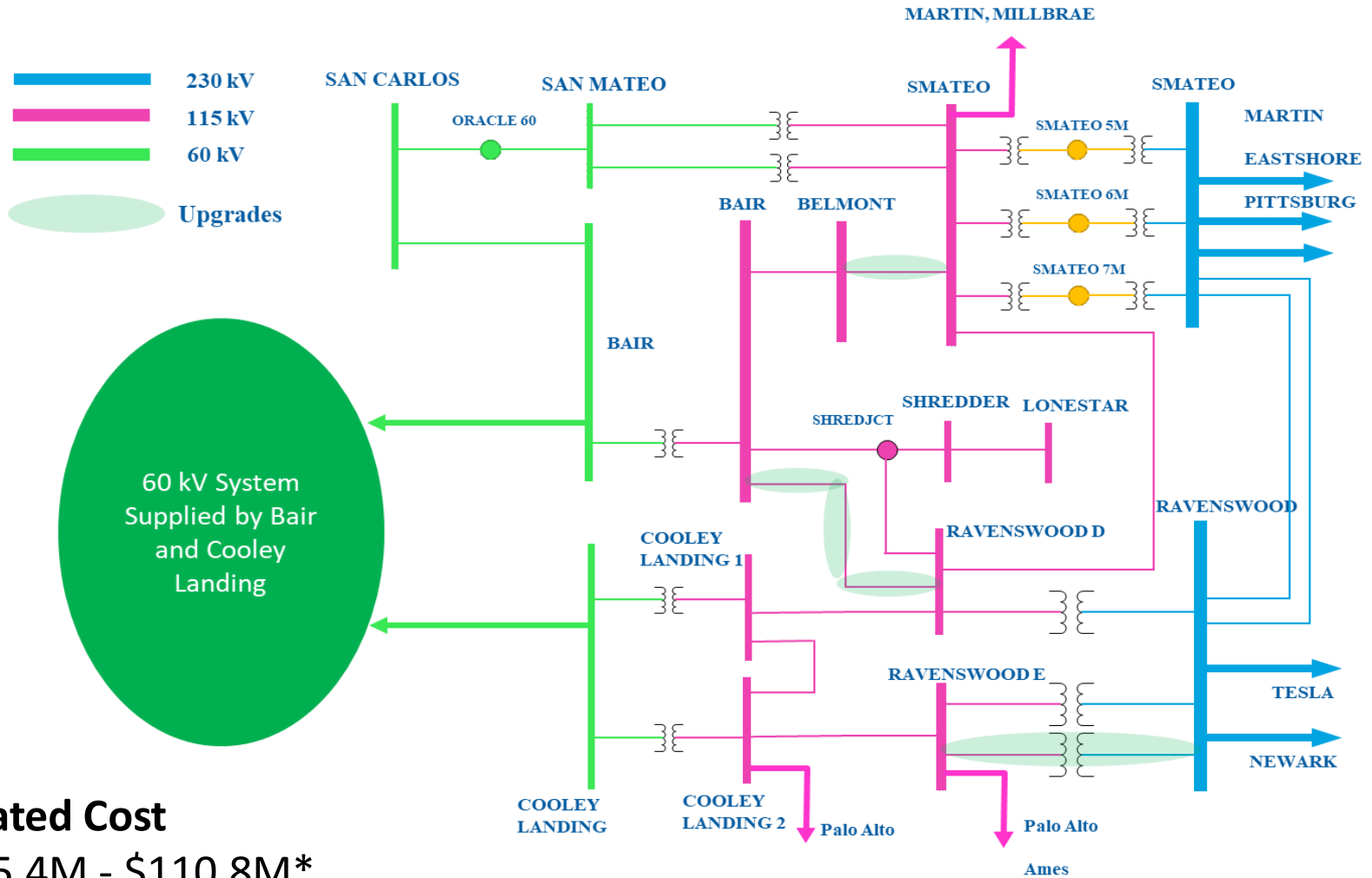


# Proposed Project

- **Project Objectives**
  - Increase 115 kV capacity to supply load in the San Mateo – Ravenswood area centered around Redwood City.
  - The new Ravenswood 230/115 kV transformer also helps address the long-term violations on the two existing Ravenswood transformers.
- **Preferred Scope**
  - Install a new 230/115 kV Transformer at the Ravenswood Substation using 420 MVA Summer Normal Rating and 460 MVA Summer Emergency Rating.
  - Reconductor 6.5 circuit miles of the San Mateo – Belmont 115 kV Line with single 477 ACSS conductor. \*
  - Reconductor 7.5 circuit miles of the Ravenswood – Bair 115 kV Line #1 with single 477 ACSS conductor. \*
  - Remove any limiting components as necessary to achieve full conductor capacity.

\* Portions of the reconducted lines are old and reaching their end of service life. Reconductoring these lines can save potential future cost of aging infrastructure replacement.

# Proposed Project (cont.)



- **Estimated Cost**
  - \$55.4M - \$110.8M\*
- **Proposed In-Service Date**
  - May 2030 or earlier

\* AACE Level 5 quality estimates includes a +100% contingency

- **Other Alternatives Considered**

- Alternative 1: Reconductor all the three overloaded lines, San Mateo – Belmont 115 kV Line, Ravenswood – Bair 115 kV #1 Line, and the San Mateo – Oracle – San Carlos section of the San Mateo – Bair 60kV Line.

Not recommended. Almost same cost in nearer term, but costs more in long-term as it still needs the new Ravenswood transformer.

- Alternative 2: Build a new line from Ravenswood to Bair. Install a new 230/115 kV transformer at Ravenswood Substation.

Not recommended. Routing and permitting challenges in environmental sensitive area for a section of the new line. Impose risk of delay and significantly higher cost if need to go underground.

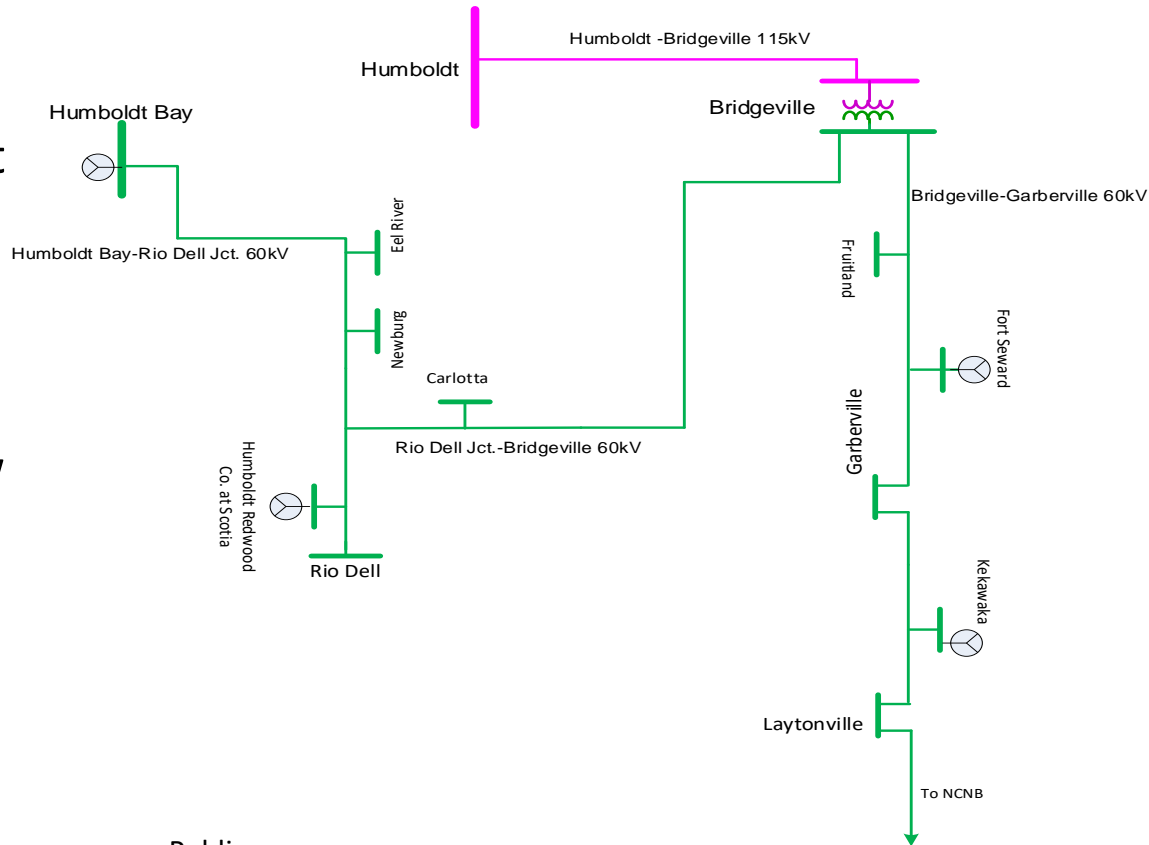
- Alternative 3: Build a new line from San Mateo to Bair. Install a new 230/115 kV transformer at Ravenswood Substation.

Not recommended. Routing and permitting challenges in environmental sensitive area that imposes risks of delay and higher cost. In addition, the cost is further inflated by longer distance and more required substation work.

# GARBERVILLE AREA REINFORCEMENT PROJECT

# Area Background

- Humboldt County is experiencing rapid growth of agriculture loads with high concentrations in the Garberville area.
- Garberville Substation receives its power from both the Humboldt and Mendocino sources through the Bridgeville-Garberville and Garberville-Laytonville 60 kV lines, respectively.
- The existing local Garberville area demand including Garberville, Fort Seward, and Fruitland Substations is 15.9 MW. Projected distribution customer driven load increase of total 14.1 MW by year 2032 could bring the maximum load to 30 MW at Garberville area.





# Assessment Results

- **Contingency Description:**
  - P0: No Contingency
  - P1 category events that cause loss of Bridgeville-Garberville 60 kV line or Bridgeville 115/60 kV Bank #1 Transformer
- **Voltage Results-Winter Peak:**

Garberville Area Peak		Pre-Project Voltage p.u.			Post-Project Voltage p.u.	Contingency	
Facility	kV	2024WP	2027WP	2032WP	2027WP	Category	Contingency Name
Garberville	60	0.894	0.877	0.884	1.029	P0	(None)
Fort Seward	60	0.906	0.889	0.894	1.035	P0	(None)
Fruitland	60	0.924	0.911	0.904	1.02	P0	(None)



# Assessment Results

- Power Flow Results-Summer Peak**

Garberville Area Peak		Pre-Project Thermal p.u.			Post-Project Thermal p.u.	Contingency	
Facility	Rating (A)	2024HS	2027HS	2032HS	2027HS	Category	Contingency Name
Bridgeville-Garberville 60 kV Line	303 (SN)	131.7%	134.3%	126.8%	41.9%	P0	(None)
Garberville - Laytonville 60 kV Line	339 (SE)	130.5%	130.1%	124.6%	0 (Consequential Load Drop)	P1	Bridgeville-Garberville 60 kV line
Laytonville - Willits 60 kV Line	363 (SE)	145.2%	142.6%	139.7%	0 (Consequential Load Drop)	P1	Bridgeville-Garberville 60 kV line
Humboldt Bay – Rio Dell Jct. 60 kV Line	499 (SE)	111.4%	119%	125.8%	37.8% (Consequential Load Drop)	P1	Bridgeville 115/60 kV Bank #1 Transformer



# Proposed Project

- **Project Objectives:** Increase Bridgeville – Garberville 60 kV line capacity to address NERC TPL-001-4 P0 and P1 thermal violations and install reactive power support to address voltage violations.
- **Preferred Scope**
  - Reconductor 36 circuit miles of Bridgeville-Garberville 60 kV line to achieve at least 631 Amps of summer normal rating and replace the wood poles with light duty steel poles (LDSP).
  - Install a 20 MVAR STATCOM at Fort Seward Substation.
  - Establish a control point to open the line section from Garberville to Kekawaka 60 kV line.
  - Establish a control point to open the line section from Rio Dell Jct. to Carlotta 60 kV line.



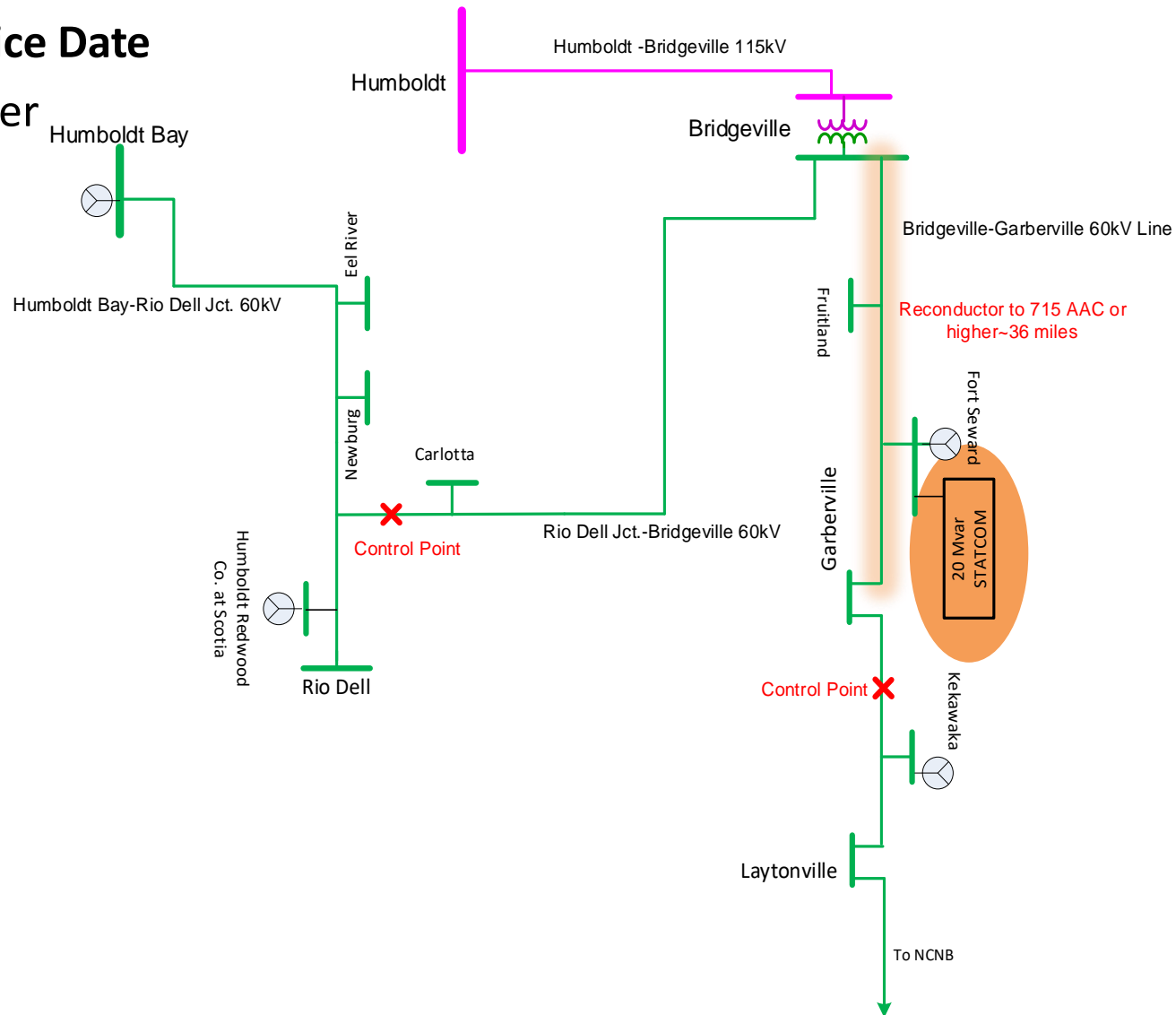
# Proposed Project (cont.)

- Proposed In-Service Date**

May 2032 or earlier

- Estimated Cost**

\$102M - \$204M\*



\*AACE Level 5 quality estimates includes a +100% contingency

- **Other Alternatives Considered**

- Alternative 1: Build a new 36 miles of Bridgeville-Garberville 115 kV line and install one 115/60 kV transformer at Garberville substation.

This alternative is not feasible due to space limitation at Garberville substation.

- Alternative 2: Reconductor about 111 circuit miles of entire Bridgeville-Garberville-Laytonville-Willits 60 kV line.

This alternative is not recommended as the cost is \$289.5M - \$579M\* which is much higher in comparison to the recommended scope.

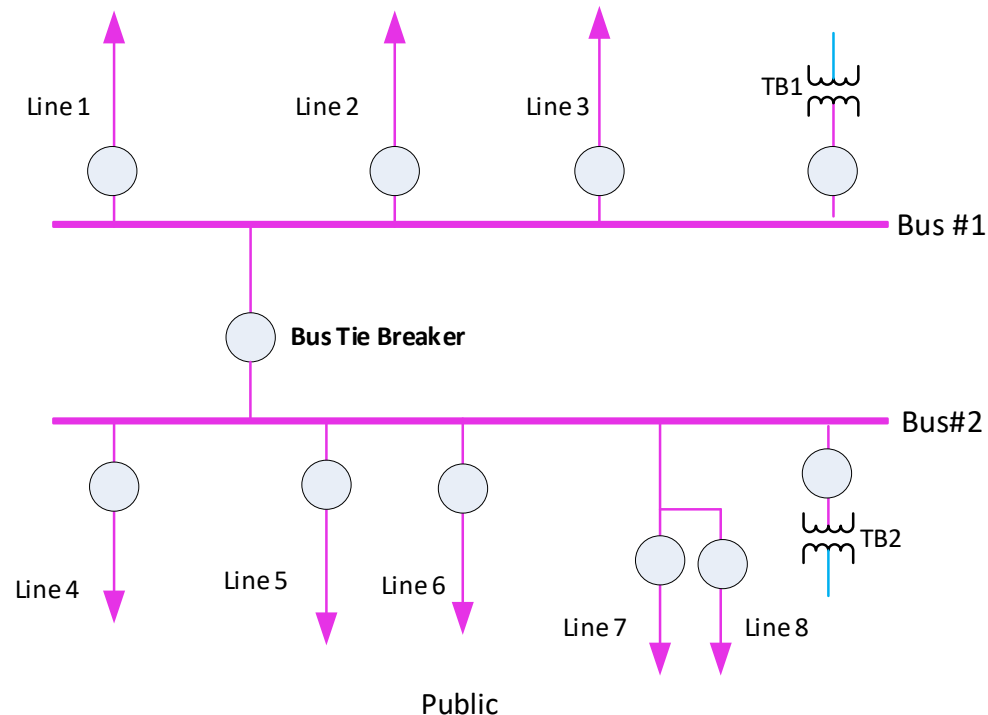
- Alternative 3: Battery Storage at Garberville substation.

This alternative is not feasible due to space limitation at Garberville substation.

\*AACE Level 5 quality estimates includes a +100% contingency

# TESLA 115 kV BUS RECONFIGURATION

- Tesla Substation is a critical source of power for the San Joaquin County
- Tesla 115 kV bus is in double-bus-single-breaker (DBSB) configuration with 10 elements (including two 230/115 kV transformer banks and eight 115 kV lines).
- The major load centers include Tracy, Lammers, Vierra, Salado and Kasson load pockets.





# Assessment Results

- **Contingency Description:**
  - **P2-4:** Fault on the bus tie breaker which will trip all the 115 kV elements.
- **Power Flow Results:**

CVLY Peak		Pre-Project			Post-Project	Contingency	
Facility	Rating	2024	2027	2032	2032	Category	Contingency Name
Tesla 115 kV area	N/A*	Not Converge**	Not Converge**	Not Converge**	N/A (This contingency doesn't exist)	P2-4	TESLA 115 kV Bus Tie Breaker Fault

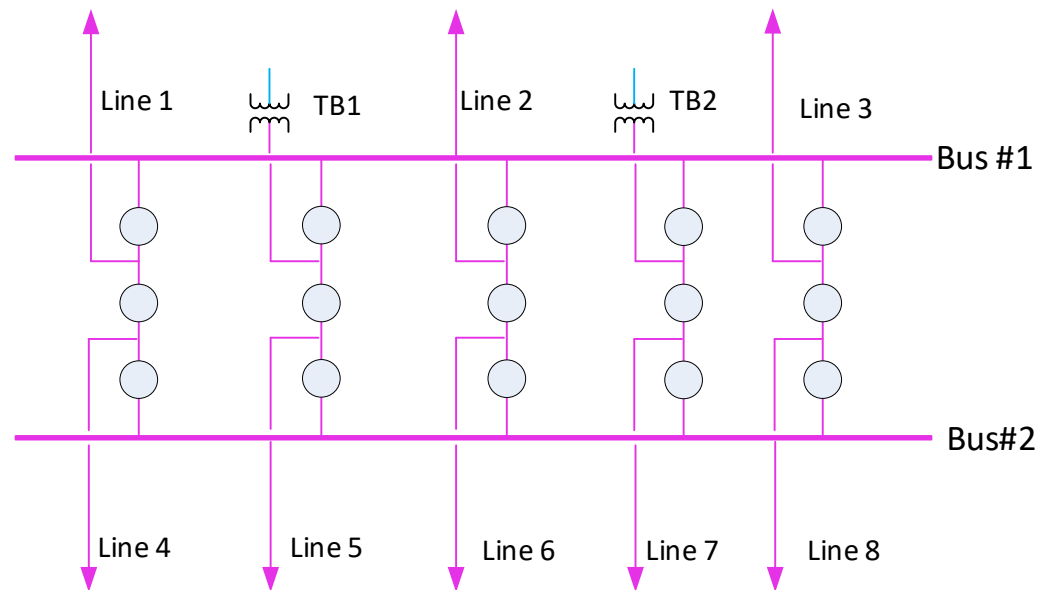
\*The contingency causes voltage collapse. No specific rating of facility with violations is listed.

\*\*The voltage collapse would result in losing about 300 MW of non-consequential load in the Tesla 115 kV area.



# Proposed Project

- **Project Objectives:** Resolve voltage collapse issue under P2-4 contingency
- **Preferred Scope**
  - Convert the current Tesla 115 kV DBSB configuration to BAAH configuration



- **Proposed In-Service Date**  
May 2030 or earlier
- **Estimated Cost**  
\$27.5M - \$55M\*

- **Other Alternatives Considered**

- Alternative 1: Tesla 115 kV bus sectionalization

Not recommended. Not feasible due to space limitation.

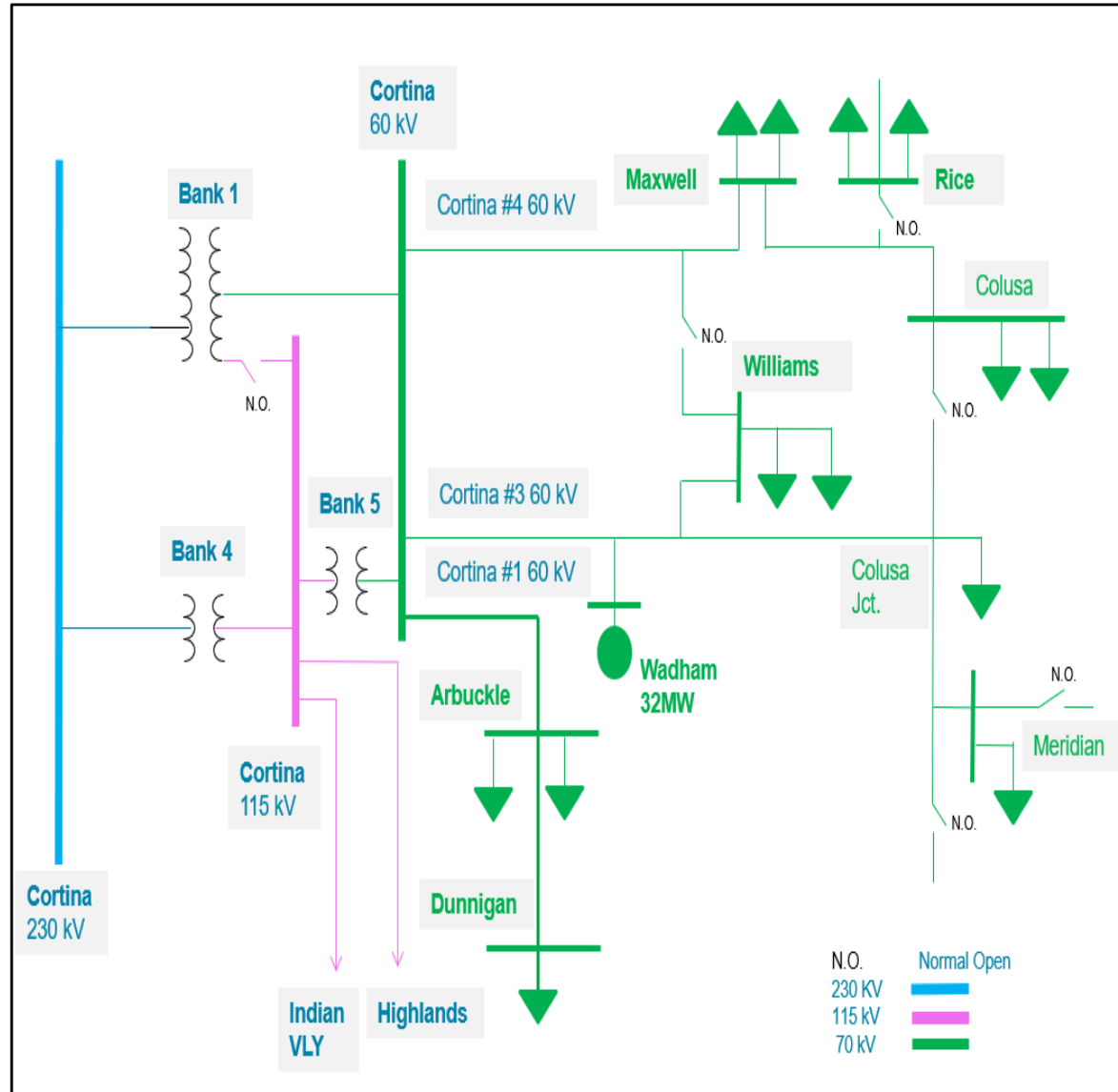
- Alternative 2: Install a Remedial Action Scheme (RAS)

Not recommended. Challenges due to the complexity of the RAS design, high requirement on the RAS reaction time, and requiring large amount of load to be dropped.

# CORTINA #1 60 kV LINE RECONDUCTORING



- Cortina 60 kV pocket is located in Colusa County and serves about 14,800 customers.
- Within the pocket, Cortina #1 60 kV line serves as the radial source to Arbuckle and Dunnigan Substations.
- Projected distribution customer driven load increase of 10 MW at Dunnigan 60 kV Station by year 2024 could bring the maximum load to 22.6 MW served by the transmission line rated at 20.78 MVA.





# Assessment Results

- Contingency Description:**

- **P0:** Normal thermal overload on 26.2 miles of Cortina #1 60 kV Line (Cortina to Arbuckle section and Arbuckle to Dunnigan section) and low voltage issue.

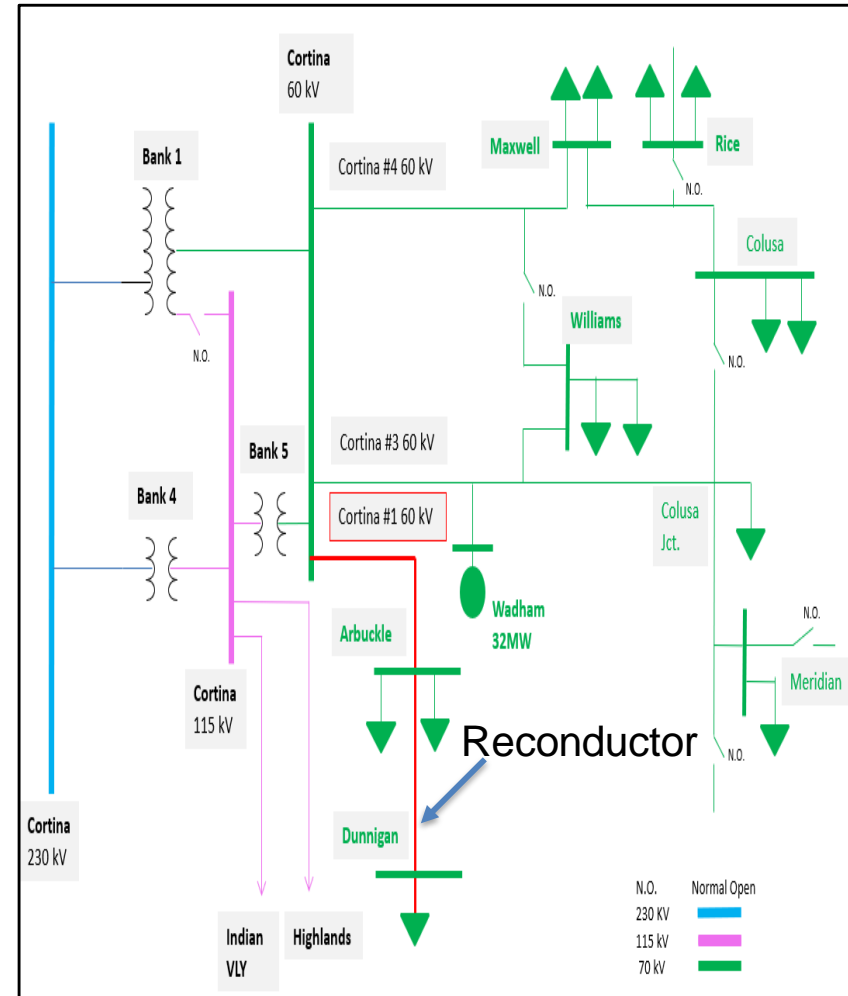
- Power Flow and Voltage Results:**

Monitored Facility		Pre-Project		Post-Project	Contingency	
Facility Name	Rating* (MVA)	2024 (%)	2027 (%)	2027 (%)	Category	Contingency Name
Cortina #1 60 kV (Cortina-Arbuckle)	41.5	130.78	134.99	57.1	P0	(None)
Cortina #1 60 kV (Dunnigan Tap-Harrington)	20.78	140.53	147.8	37.5	P0	(None)

\*Summer normal rating

Monitored Facility		Pre-Project Voltage p.u.		Post-Project Voltage p.u.	Contingency	
Facility	kV	2024	2027	2027	Category	Contingency Name
Dunnigan	60	0.87	0.84	0.94	P0	(None)
Dunnigan Tap	60	0.96	0.93	0.96	P0	(None)

- **Project Objectives:** Increase Cortina #1 60 kV line capacity to address NERC TPL-001-4 P0 thermal overload issue and low voltage issue.
- **Preferred Scope**
  - Reconductor 15.4 circuit miles between the Cortina Substation and Arbuckle Substation (From Cortina to 015/259) on the Cortina #1 60 kV Line with a larger conductor to achieve at least 818 Amps during normal conditions.
  - Reconductor 10.8 circuit miles between the Arbuckle Substation and Dunnigan Substation (From 015/260 to Dunnigan) on the Cortina #1 60 kV Line with a larger conductor to achieve at least 818 Amps during normal conditions.
  - Remove any limiting components as necessary to achieve full conductor capacity.



- **Proposed In-Service Date**
  - May 2028 or earlier
- **Estimated Cost**
  - \$47.14M - \$94.28M\*
- **Other Alternatives Considered**
  - Alternative 1: Energy Storage

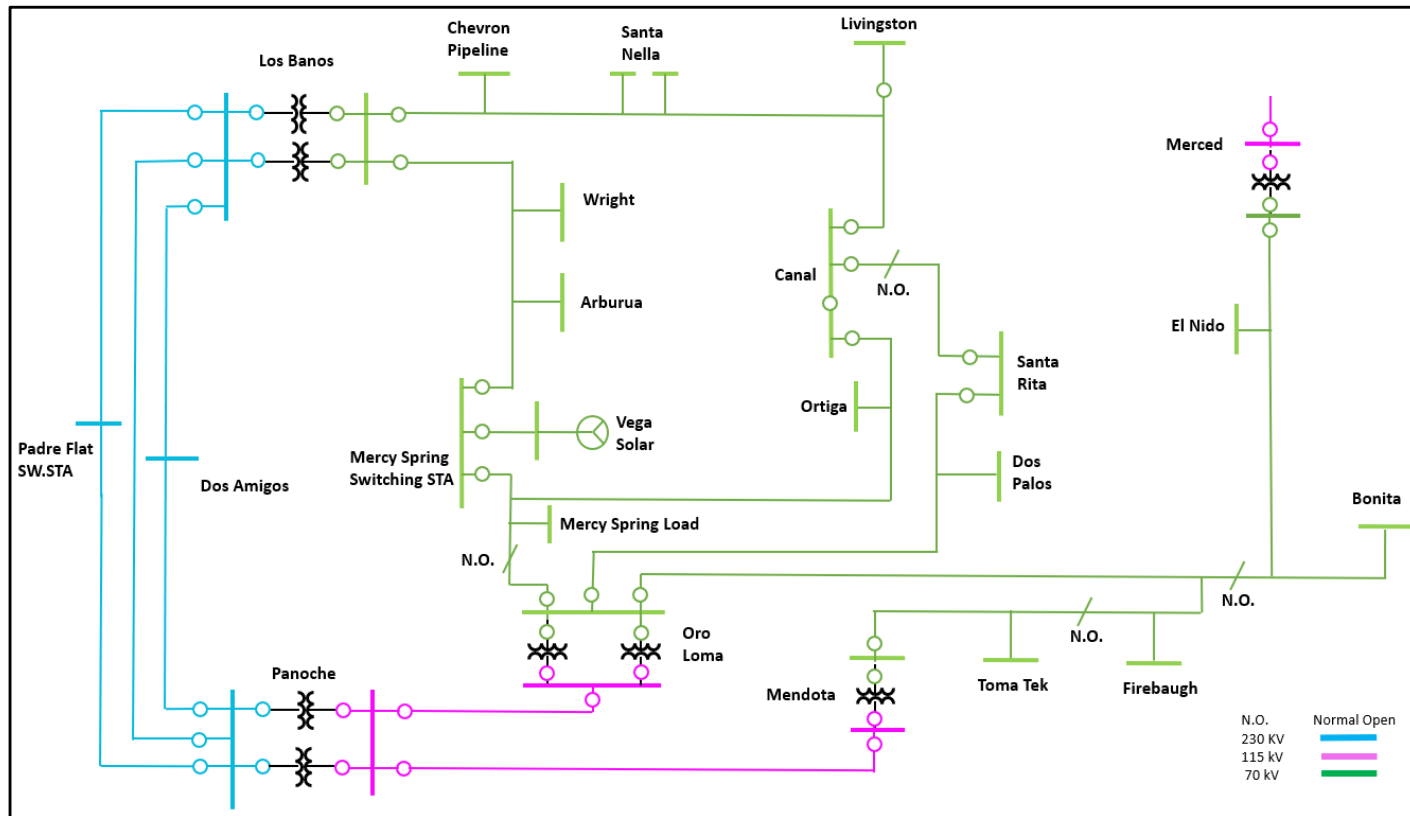
This alternative is not recommended because the energy storage charging capability is limited by the existing line capacity and will be further limited by the future load increase at Dunnigan Substation.

\*AACE Level 5 quality estimates includes a +100% contingency

# LOS BANOS 70 kV AREA REINFORCEMENT

# Area Background

- The Los Banos 70 kV Area, located in Merced County, is radially supplied by two 230/70 kV transformers at Los Banos Substation during summer season.
- Projected distribution customer driven load increase of 27.5MW at Canal, Ortiga, Santa Nella and Wright by year 2027 will further exacerbate the heavy load condition.





# Assessment Results

- Contingency Description:**

- P1 category events that cause loss of Los Banos 230/70 kV Bank #4 or one of the two paths serving Los Banos 70 kV area.

- Power Flow and Voltage Results:**

Monitored Facility		Pre-Project		Post-Project	Contingency	
Facility	SE Rating* (MVA)	2024 (%)	2027 (%)	2027 (%)	Category	Contingency Name
Los Banos 230/70 kV Bank 3	144	99.97	105.69	58.78	P1	P1-3: LOSBANOS 230/70KV TB 4
Los Banos-Livingston Jct.-Canal 70 kV	90	93.48	101.58	46.2	P1	P1-2: LOS BANOS-MERCY SPRINGS SW STA 70KV
Los Banos-Mercy Springs SW STA 70 kV	90	127.06	133.71	41.15	P1	P1-2: LOS BANOS-LIVINGSTON JCT-CANAL 70KV

Monitored Facility		Pre-Project Voltage p.u.		Post-Project Voltage p.u.	Contingency	
Facility	kV	2024	2027	2027	Category	Contingency Name
Canal	70	0.83	0.85	0.96	P1	P1-2: LOS BANOS-LIVINGSTON JCT-CANAL 70KV
Ortiga	70	0.87	0.87	0.99	P1	P1-2: LOS BANOS-LIVINGSTON JCT-CANAL 70KV
Arburua	70	0.92	0.9	1.01	P1	P1-2: LOS BANOS-LIVINGSTON JCT-CANAL 70KV

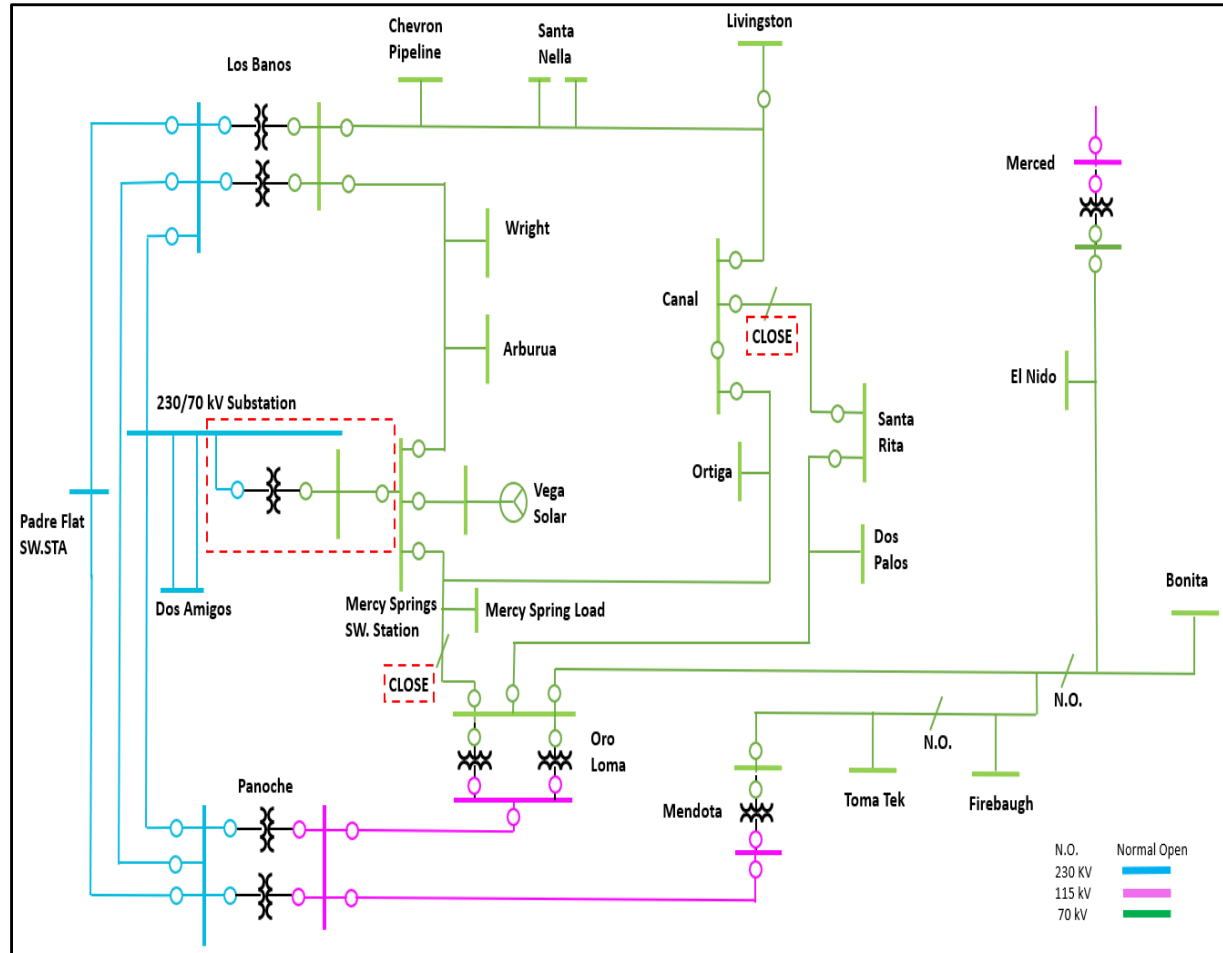
Note: Only buses with the most severe low voltages issue were listed above.

- **Project Objectives:** Install a 230/70 kV transformer at the new generation driven 230 kV switching station to provide an additional source to Los Banos 70 kV area via Mercy Springs 70 kV Switching Station to address NERC TPL-001-4 P1 thermal overload issue and low voltage issue.
- **Preferred Scope**
  - Install 230 kV partial bay at the new generation driven 230 kV switching station adjacent to Dos Amigos PP 230 kV Substation.
  - Add a new 70 kV Bus in the new generation driven 230 kV switching station, then it will be converted to a new 230/70 kV substation.
  - Install one 230/70 kV transformer at the new 230/70 kV substation.
  - Install a new 70 kV transmission line from new 70 kV Bus to Mercy Springs 70 kV Bus, and the new line is about one mile.
  - Install one breaker at Mercy Springs 70 kV Switching Station.



- **Proposed In-Service Date**
  - May 2029 or earlier
- **Estimated Cost\***
  - \$30M - \$60M\*\*

Note: Align ISD of this project with previously CAISO TPP approved Oro Loma 70kV Area Reinforcement project and new generation driven 230 kV switching station project.



**Figure 1 – Single Line Diagram for the Preferred Scope**

\* Does not include the new generation driven 230 kV Switching Station near Dos Amigos

\*\*AACE Level 5 quality estimates includes a +100% contingency

- **Other Alternatives Considered**

- Alternative 1: Energy Storage

This alternative is not feasible because the energy storage charging capability is limited by the existing line capacity and will be further limited by the future load growth.

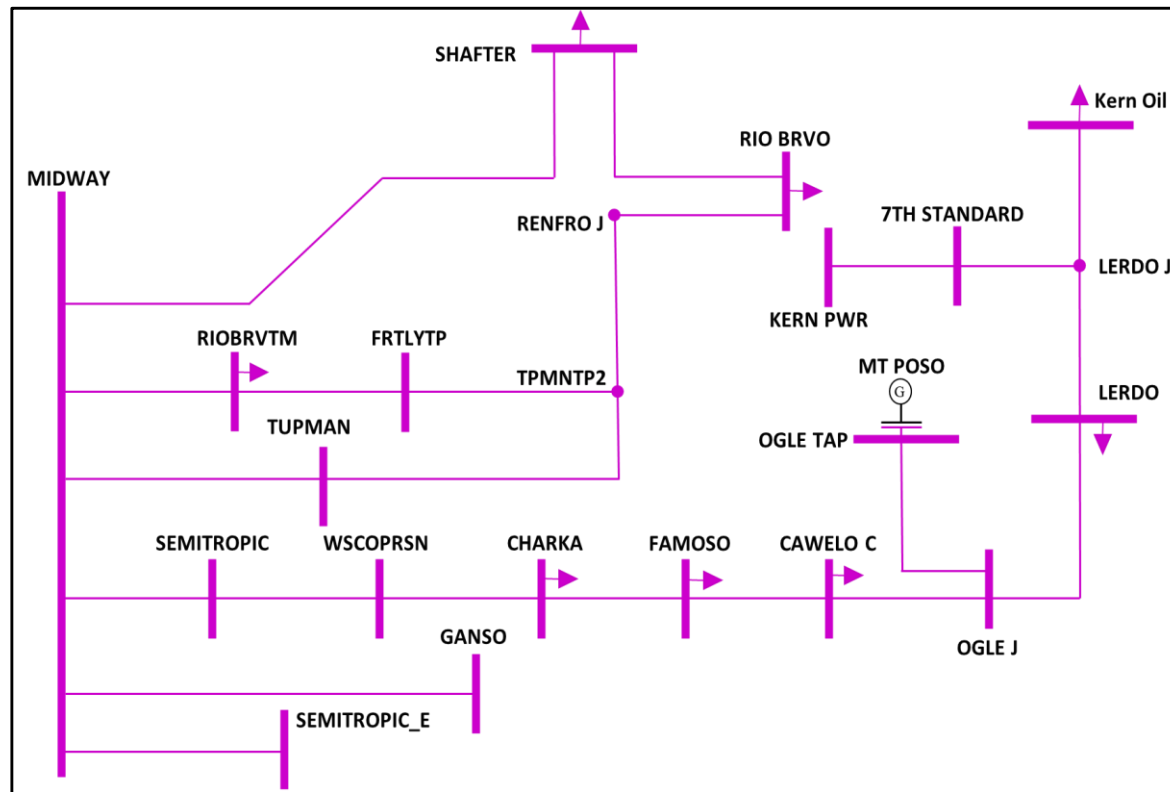
- Alternative 2: Reconductor transmission lines and upgrade transformer bank

This alternative is to reconductor both transmission lines feeding this area and upgrade Los Banos Bank #3 without changing the existing system topology. It is not recommended because the cost estimate is higher than the preferred alternative.

# **NORTH-EAST KERN 115 kV RECONDUCTORING PROJECT**

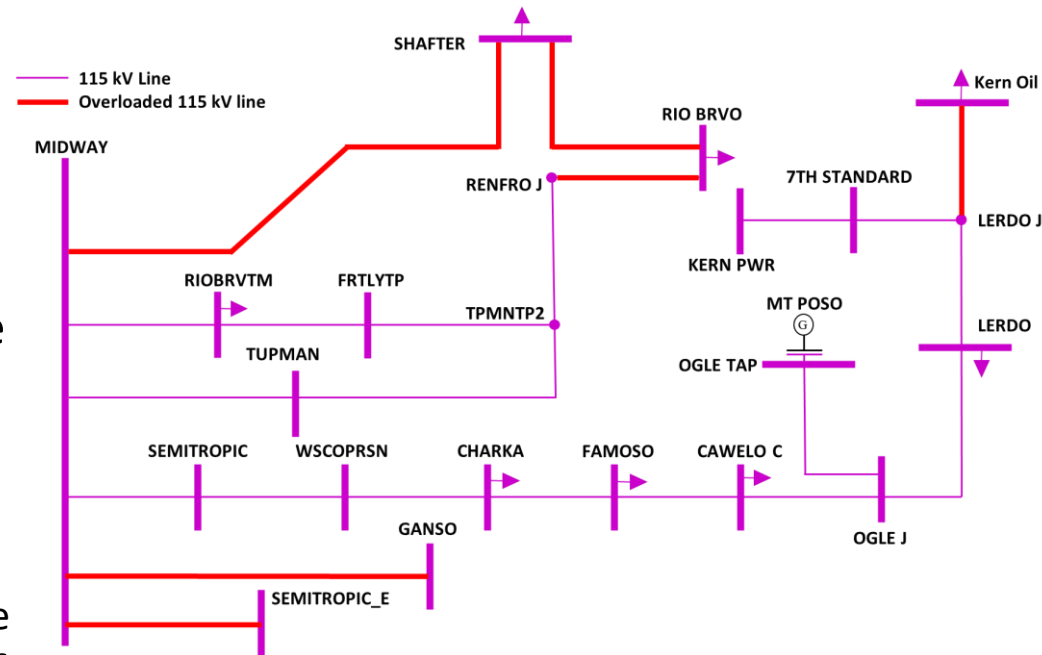
# Area Background

- Power for the Kern Division load is supplied through the Midway, Kern Power Plant, and Wheeler Ridge 230 kV Substations.
- The northeast Kern pocket include several 115 kV substations which are connected to Midway, Kern Oil, and Kern Power Plant.
- This pocket has a projected load growth of over 85 MW due to new EV charging stations, warehouses, business parks and agricultural loads.



## Contingency Description:

1. P1-2 category event that cause loss of Midway-Shafter 115 kV line
  - Overload Rio-Bravo-Renfro J 115 kV line
2. P1-2 category event that cause loss of Semitropic -Midway #1 115 kV line
  - Overload Midway-Ganso 115 kV line
3. P2-1 category event that cause loss of TPMANTP2-Renfro J 115 kV line
  - Overload Midway-Shafter & Shafter-Rio Bravo 115 kV lines
4. P2-1 category event that cause loss of Midway-Ganso 115 kV line
  - Overload Midway-Semitropic\_E 115 kV line
5. P3 category event that cause loss of Kern PWR-7TH Standard 115 kV line and MT POSO gen. Unit 1
  - Overload Lerdo J-Kern Oil 115 kV





# Assessment Results

- Power Flow Results:**

Monitored Facility		Pre-Project		Post-Project	Contingency	
Facility Name	Rating (A)	2027 (%)	2032 (%)	2032 (%)	Category	Contingency Name
Midway-Shafter 115 kV	399 (SE)	165%	185%	76%	P2-1	Midway-Tupman-Rio Bravo-Renfro 115 kV (Tpmantp2-Renfrjct)
Shafter-Rio Bravo 115 kV	399 (SE)	114%	116%	48%	P2-1	Midway-Tupman-Rio Bravo-Renfro 115 kV (Tpmantp2-Renfrjct)
Rio Bravo-Renfro J 115 kV	399 (SE)	135%	143%	59%	P1-2	Midway-Shafter 115 kV
Lerdo J-Kern Oil 115 kV	514 (SE)	119%	120%	64%	P3	7TH Standard-Kern 115 kV & Mt Poso 13.80 kV Gen Unit 1
Midway-Ganso 115 kV	975 (SE)	108%	110%	63%	P1-2	Semitropic -Midway #1 115 kV
Midway-Semitropic_E 115 kV	975 (SE)	108%	110%	63%	P2-1	Smyrna-Semitropic-Midway 115 kV (Ganso-Midway)



# Proposed Project

- **Preferred Scope**

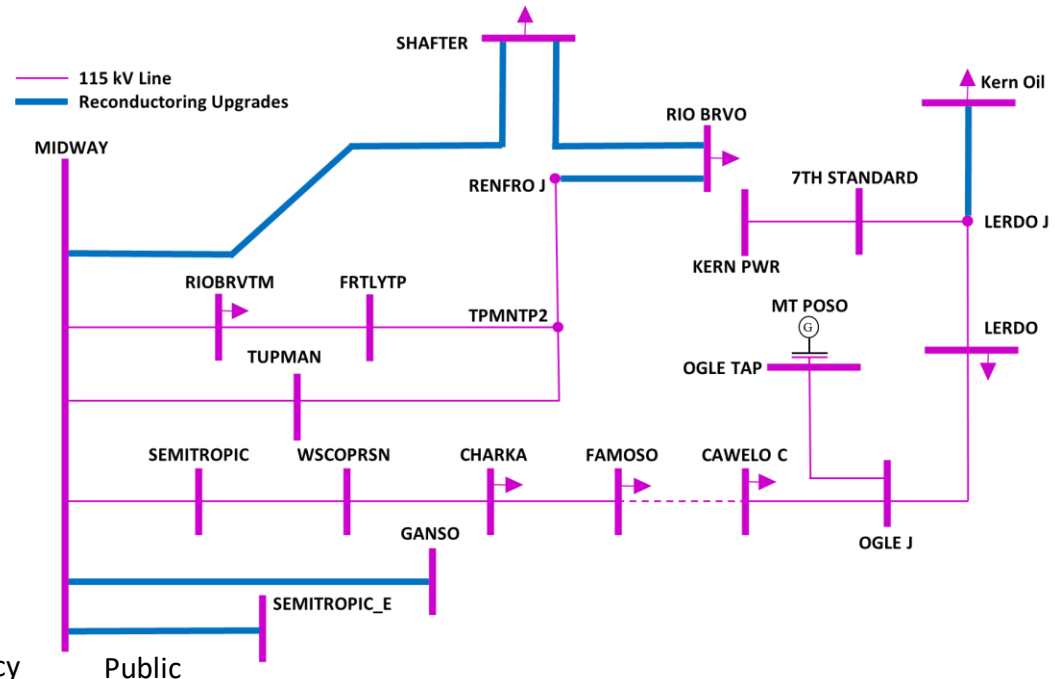
- Reconductor ~13.6 miles of Midway – Shafter 115 kV Line
- Reconductor ~8.3 miles of Shafter – Rio Bravo 115 kV Line
- Reconductor ~3.9 miles of Rio Bravo – Renfro Junction 115 kV Line
- Reconductor ~3.5 miles of Lerdo J – Kern Oil 115 kV Line
- Reconductor ~6.8 miles of Midway – Ganso 115 kV Line
- Reconductor ~14.1 miles of Midway – Semitropic\_E 115 kV
- Convert the existing control point to a summer setup to open line section from Wasco to McFarland 70 kV line.
- Convert the existing control point to a summer setup to open line section from Famoso to Cawelo C 115 kV line.

- **Proposed In-Service Date**

- May 2032 or earlier

- **Estimated Cost**

- \$128M - \$256M\*



\*AACE Level 5 quality estimates includes a +100% contingency

## Other Alternatives considered

- Alternative 1: Terminate idle line from Rio Bravo 115 kV to 7TH Standard 115 kV and Build new switching station at Shafter 115 kV junction
  - Not recommended. The cost is comparable, however, land acquisition, permitting a new switching station and substation upgrades will be challenging.
- Alternative 2: Energy Storage
  - This alternative is in the conceptual phase and studies are ongoing to determine if adding 10 to 20 MW of BESS at Lerdo, Rio Bravo, Shafter, Ganso and Goose Lake substations is feasible.
  - MW and MWh needs are to be determined, MWh is critical to size BESS
  - Charging analysis is required to ensure the energy storage equipment charging window is not limited by the existing line capacity.
  - Deliverability studies would also need to be completed to ensure all necessary upgrades and costs are considered.