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# 2012 Grid Assessment Results

## CAISO Stakeholder Meeting

### September 26-27, 2012

# Agenda

- **Introduction**
- **2012 Grid Assessment Study**
  - **Study Scope**
- **Expansion Plan Summary**
  - **Study Results & Expansion Plan**
- **Project Summaries**
  - **Projects requiring CAISO approval**
- **Questions**

# San Diego Area - Summary

- The assessment identified:
  - Category B and Category C overloads.
  - Low voltages and voltage deviations on 69kV substations driven by Category B contingencies.
- Comparing to last year results:
  - All Category B overloads until years 2017 and 2022 mitigated by projects and/or SPS.

# Objectives

- SDG&E Project Proposals
  - Mitigate overloaded facilities
    - Category B contingencies
  - Operating procedures, SPS
    - Category C contingencies

# 2012 Study Scope

- Five-Year Studies (2013-2017)
- Ten-Year Study (2022)

# Expansion Plan Summary

Project #	Project Title	ISO Status	ISD
<b>Proposed Projects Requiring CAISO Approval</b>			
<b>69 kV Projects</b>		<b>138 kV Projects</b>	
<b>69 kV Projects</b>		<b>230 kV Projects</b>	
P12XYZ	Metro Area 69kV Rebuild	Pending	2017/2022
P12XYZ	Sweetwater Reliability Enhancement	Pending	2017
P12XYZ	TL69XX San Luis Rey – Monserate: New Line	Pending	2014
P12XYZ	TL694: Morro Hill Tap – Melrose Reconductor	Pending	2016
P12XYZ	TL6912: Pendleton – San Luis Rey Reconductor	Pending	2014
P12XYZ	Del Mar Reconfiguration: Loop-In TL674A at Del Mar and RFS TL666D	Pending	2015
P12XYZ	TL600B: Clairemont – Clairemont Tap Reconductor	Pending	2022
P12XYZ	TL662: Penasquitos – Torrey Pines Terminal Equipment Upgrades	Pending	2020
P12XYZ	TL632A: Granite-Granite Tap Loop-In at Granite	Pending	2015
P12XYZ	TL6906: Penasquitos-Miramar Loop-In at Mesa Rim	Pending	2015
P12XYZ	TL13820 Sycamore – Chicarita: Reconductor	Pending	2014
P12XYZ	TL13821 Temporary Reconfiguration	Pending	ASAP
P12XYZ	Sycamore 230kV Reactive Support Project: Synchronous Condenser	Pending	2015
P12XYZ	Mission 230kV Reactive Support Project: Synchronous Condenser	Pending	2017
P12XYZ	Penasquitos 230kV Reactive Support Project: Synchronous Condenser	Pending	2017
P12XYZ	Talega 230kV Reactive Support Project: Synchronous Condenser	Pending	2018
P12XYZ	New 230kV Sycamore – Penasquitos Line	Pending	2017
P12XYZ	Los Coches 230kV Expansion	Pending	2017
P12XYZ	New Imperial Valley-IID Flow Control Device	Pending	2014

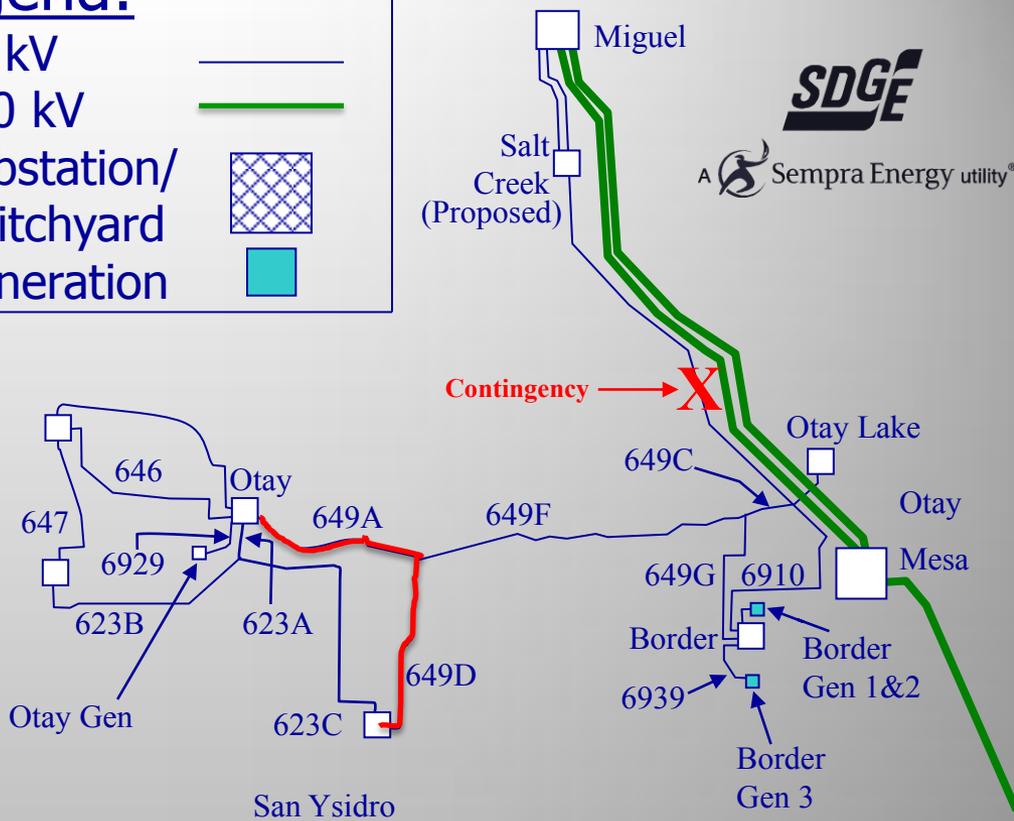
# Metro Area 69kV Rebuild

- N-1 Overloads starting in 2017, 2022
  - TL649 OY – SYO – BD
  - TL623 OY – SYO – IB
- Overloads in 2017 are related to the dispatch limitations of Border Gens 1, 2, and 3.
- Overloads beginning in 2022 on 623C and 649D arise from the forecasted load at SYO.

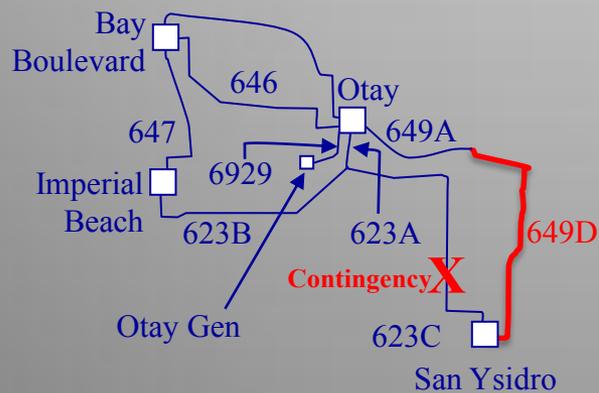
## Legend:

- 69 kV 
- 230 kV 
- Substation/ Switchyard 
- Generation 

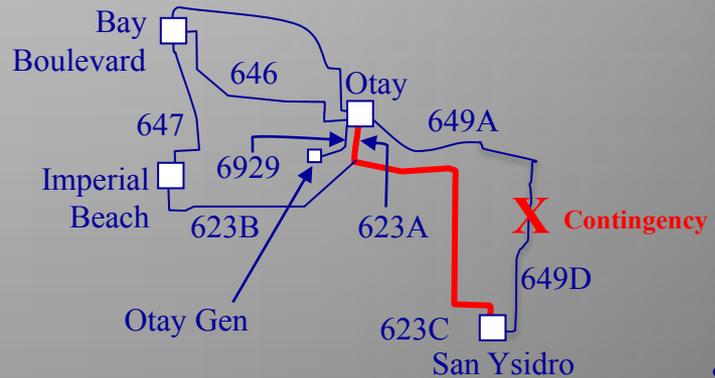
## Violation #1: 2017



## Violation #2: 2022



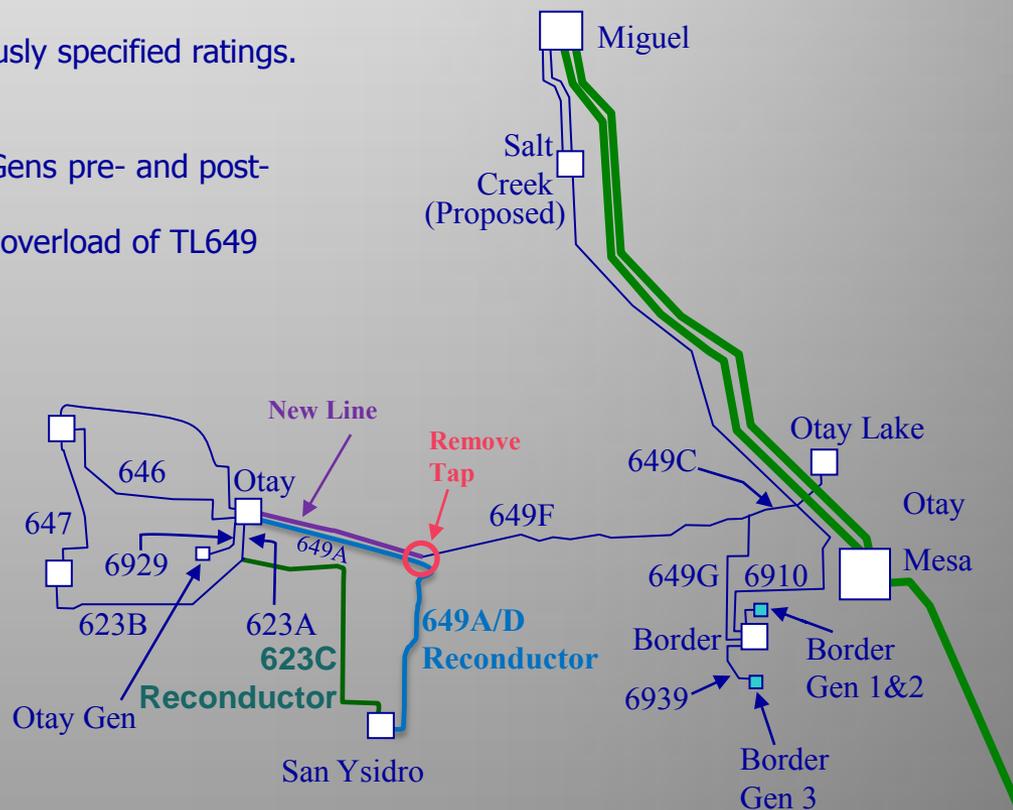
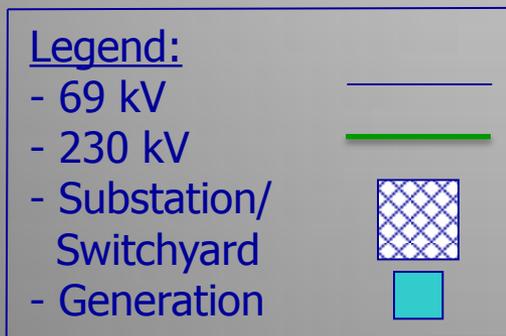
## Violation #3: 2022



# Metro Area 69kV Rebuild

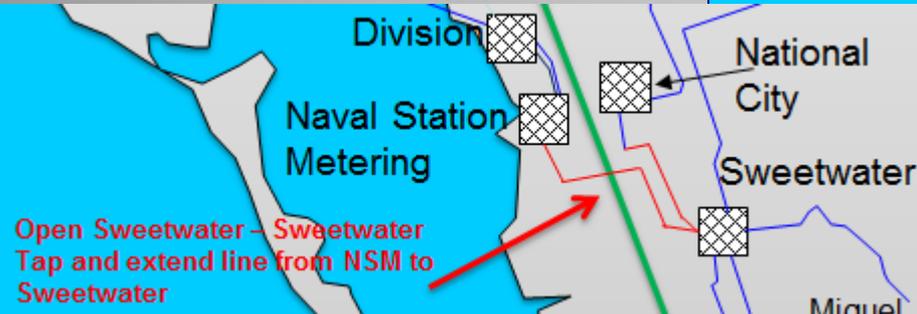
- Preferred Scope:
  - Upgrade TL649A/D to achieve a minimum continuous/emergency rating of 97/136 MVA.
  - Instead of two segments make TL649A/D into one continuous line from Otay to San Ysidro.
  - Create a new parallel 69kV line from Otay, bypassing Otay Lake Tap, then to be connected with TL649F with a minimum continuous/emergency rating of 97/136 MVA.
  - Remove Otay Lake Tap from service.
  - Upgrade TL623C to achieve a minimum continuous rating of 105 MVA.
  - Cost: \$25 - \$33 Million (ISD 2017/2022)
- Benefits:
  - Allows for full dispatch of interconnected Border Gens pre- and post- contingency.
  - The current SPS designed to prevent the thermal overload of TL649 can be removed.
  - TL649 becomes a three terminal line instead of a four terminal line.

- Alternative Scope:
  - Reconductor TL649A/D and TL623C to the previously specified ratings.
  - Cost: \$17 - \$21 Million (ISD 2017/2022)
- Benefits:
  - Allows for full dispatch of interconnected Border Gens pre- and post- contingency.
  - The current SPS designed to prevent the thermal overload of TL649 can be removed.



# Sweetwater Reliability Enhancement

- N-1 overload starting in 2017
  - TL603B Sweetwater – Sweetwater Tap
- Preferred Mitigation:
  - Open Sweetwater Tap and extend the line from Naval Station Metering into Sweetwater. (ISD 2017)
  - Cost: \$11 - \$14 Million
- Project Diagram



- Alternative Scope:
  - Reconductor TL603B.
  - Cost: \$10 - \$12 Million

Legend:  
 - 69 kV  
 - 230 kV  
 - Substation/  
 Switchyard

# New TL69XX San Luis Rey – Monserate

- N-1 overloads starting in 2014/2016:

- TL694A Melrose – Morro Hill Tap 69kV in 2016
- TL6912 Pendleton-San Luis Rey 69kV in 2014

- Mitigation

Preferred Scope:

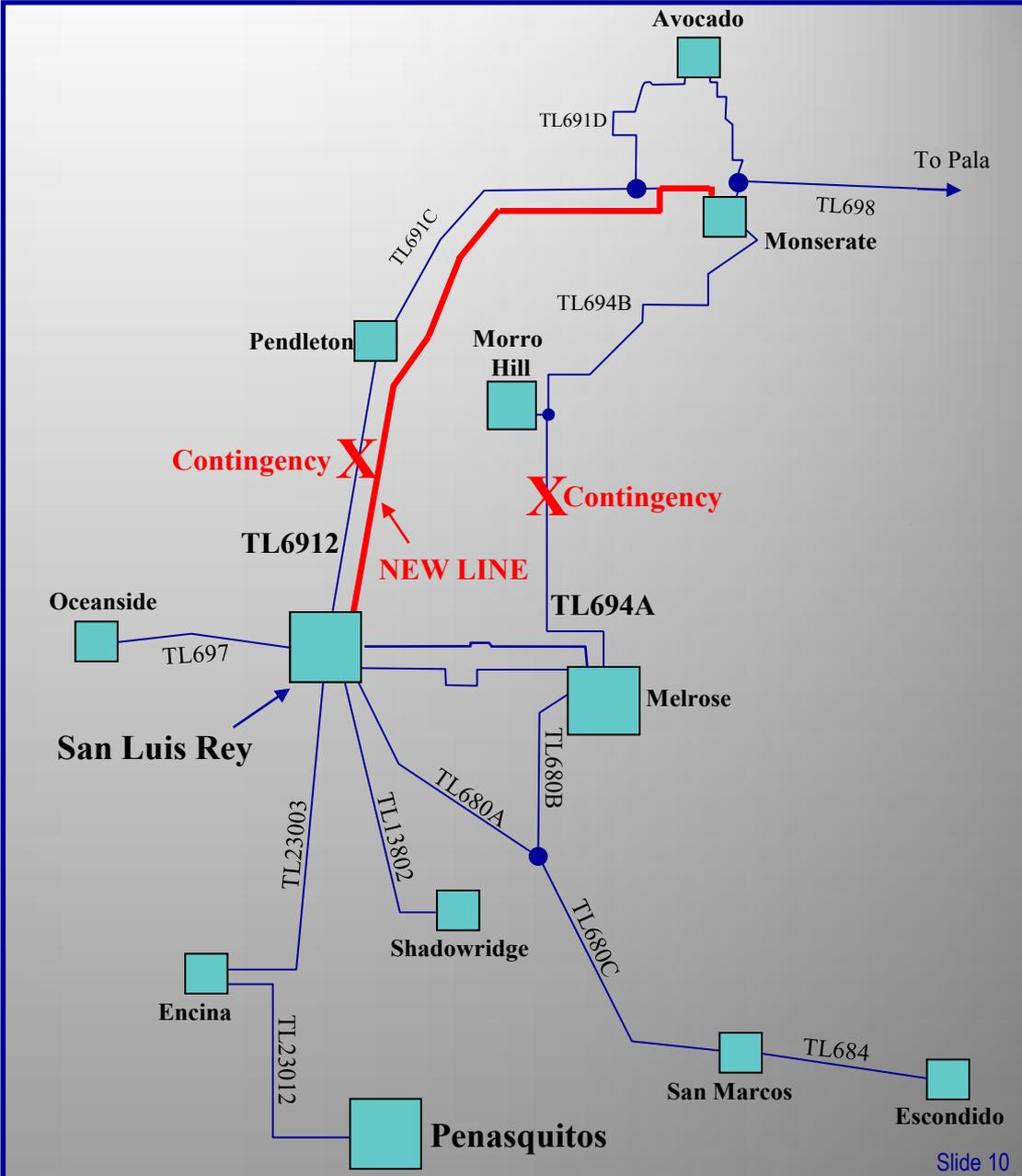
- Add a new San Luis Rey-Monserate line TL69XX.
- Cost: \$35 - \$40 Million.
- ISD: 2014

Alternative Scope:

- Reconductor TL694A and TL6912.
- Cost: \$27 – \$35 Million.

Short term mitigation:

- Dispatch local peakers. Not acceptable for long term.



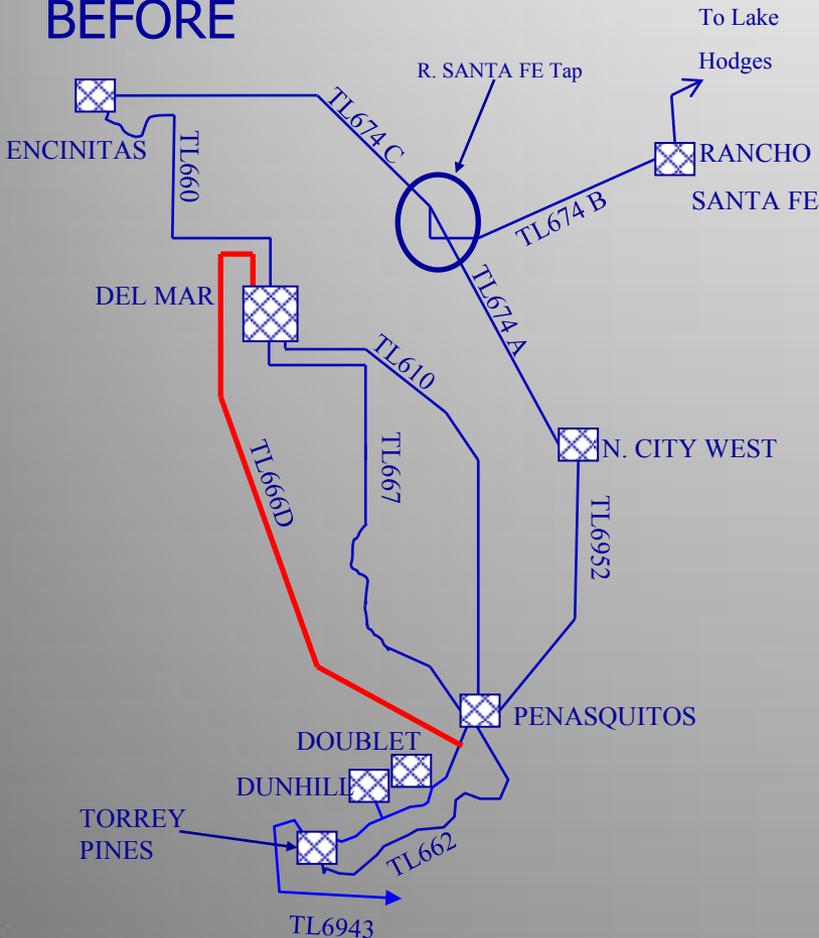
# Loop-In TL674A at Del Mar and RFS TL666D



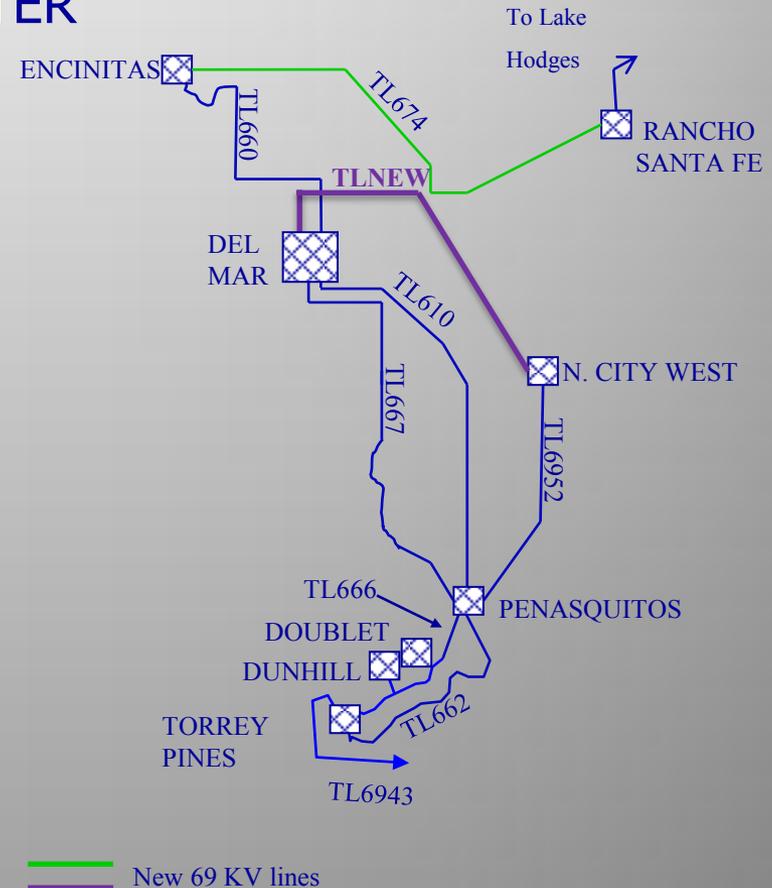
## Scope:

- Remove from service TL 666D. (Aging infrastructure, Maintenance access hindered due to location, environmentally sensitive areas)
- Loop in TL674A into Del Mar and terminate at TL666D CB.
- Three terminal TL674 becomes two individual lines: Del Mar – North City West & Encinitas – Rancho Santa Fe
- Cost: \$12 - \$15 Million. ISD 2015. (Alternative: Relocation and Undergrounding cost \$25 - \$30 Million)

## BEFORE



## AFTER



# TL600B: Clairemont – Clairemont Tap Reconductor

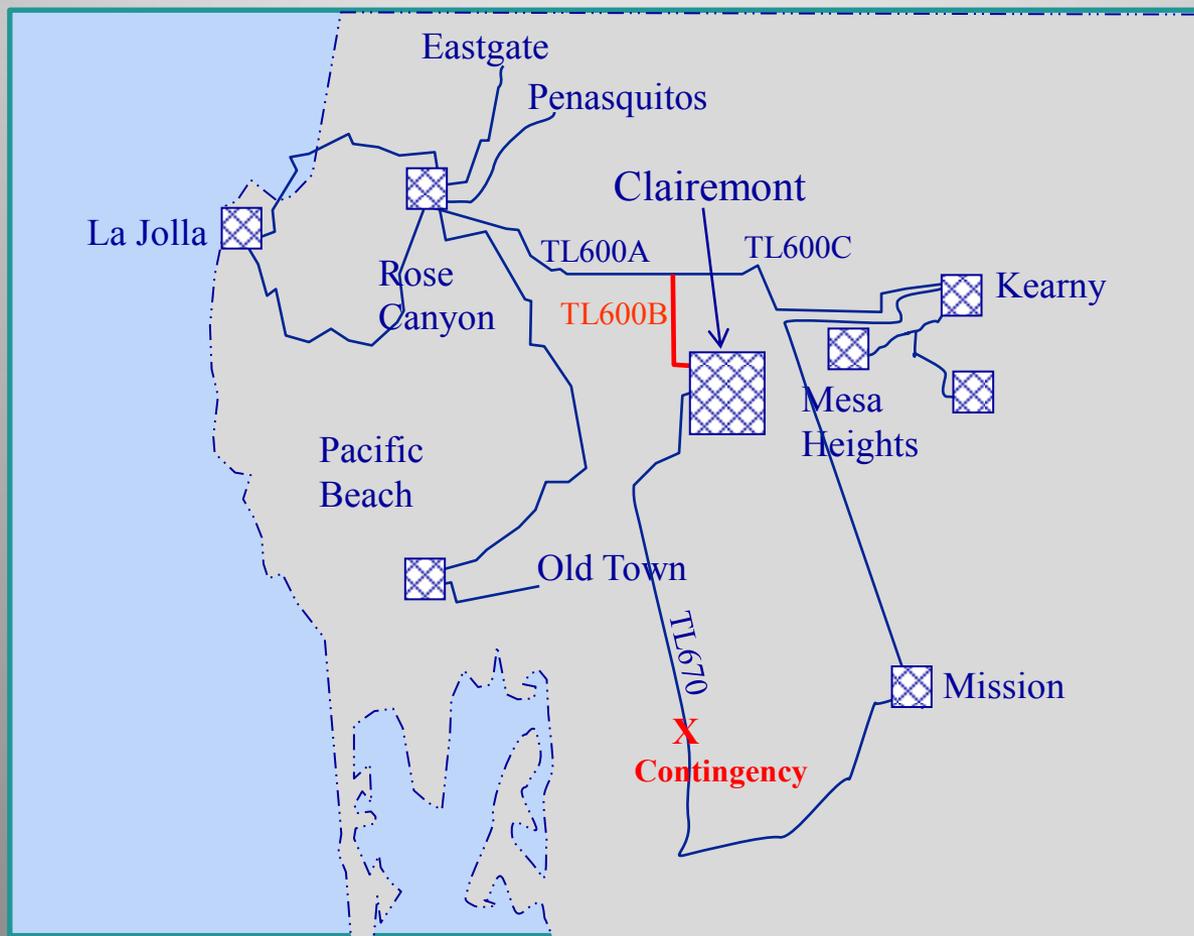
- N-1 Contingency overload starting in 2022:

- TL600B: Clairemont – Clairemont Tap

- Mitigation Scope:

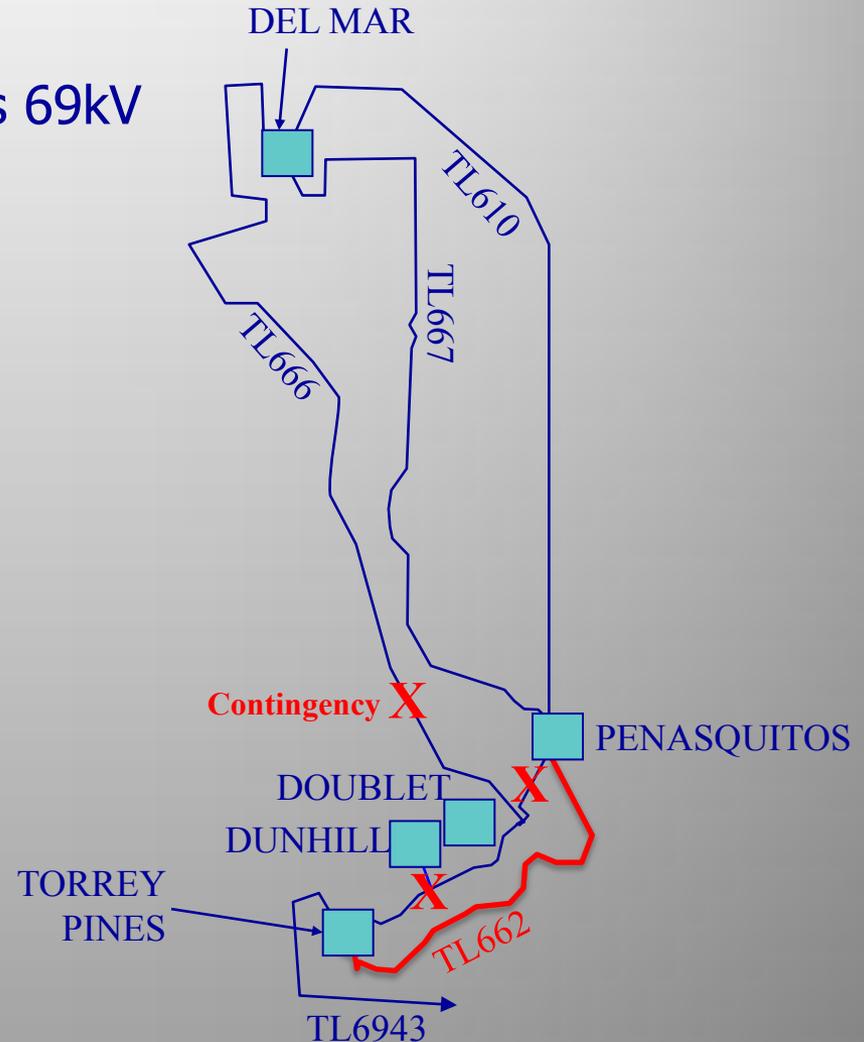
- Reconductor TL600B to a minimum continuous rating of 100 MVA.

- Cost: \$2 - \$3 Million. (ISD 2022)



# TL662: Penasquitos – Torrey Pines Terminal Equipment Upgrades

- N-1 overload starting in 2020:
  - TL662 Penasquitos – Torrey Pines 69kV
- Mitigation Scope:
  - Terminal Equipment Upgrades.
- Cost: less than \$1 Million.
- ISD: 2020



# TL632A: Granite-Granite Tap Loop-In

## • Driving Factors:

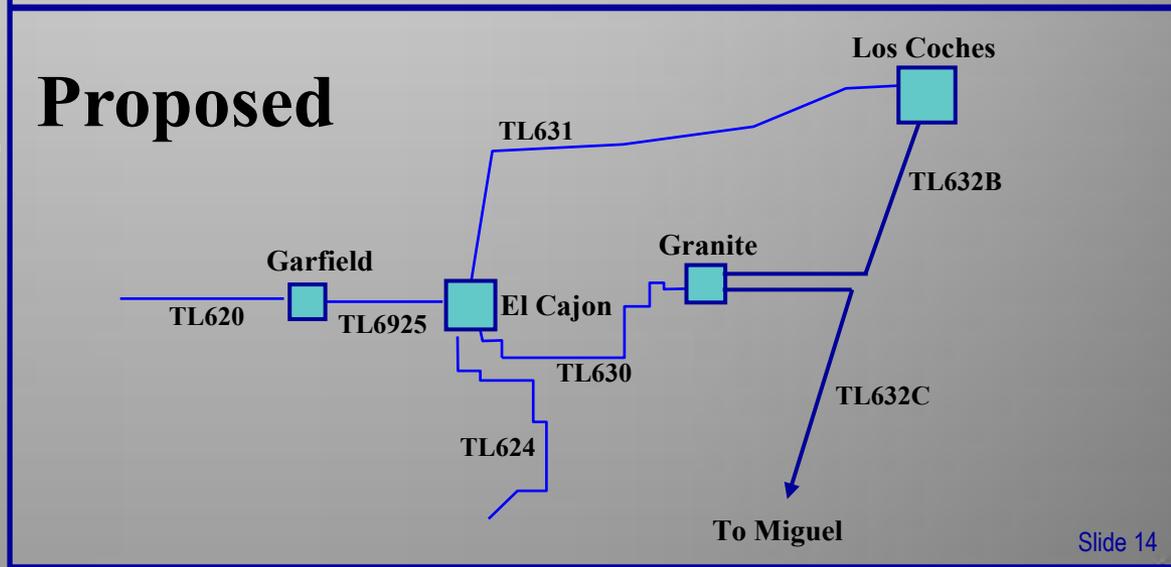
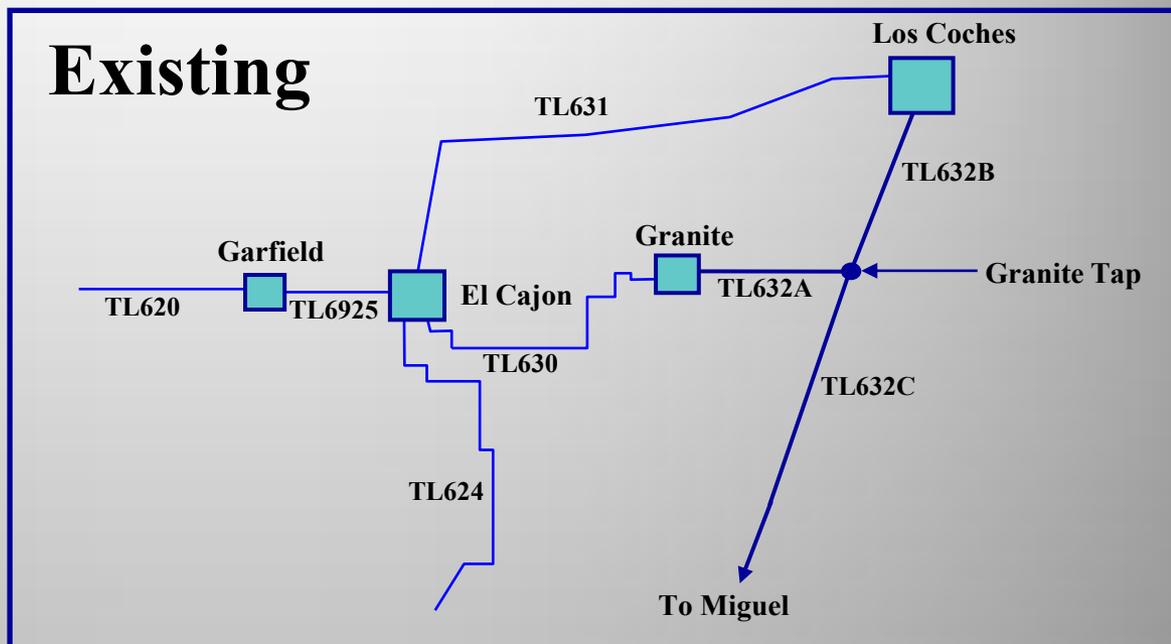
- Granite Sub is on Grid Ops substation watch list with 100+ MW of load (26,259 customers) at risk.
- Weak distribution ties make only ~16% of customer load transferable if Granite experiences an outage.
- TL632A is loaded to 98% of it's continuous rating in 2017 for N-0.
- Removal of an existing tap.

## • Scope:

- Open Granite Tap and loop in TL632 into Granite.

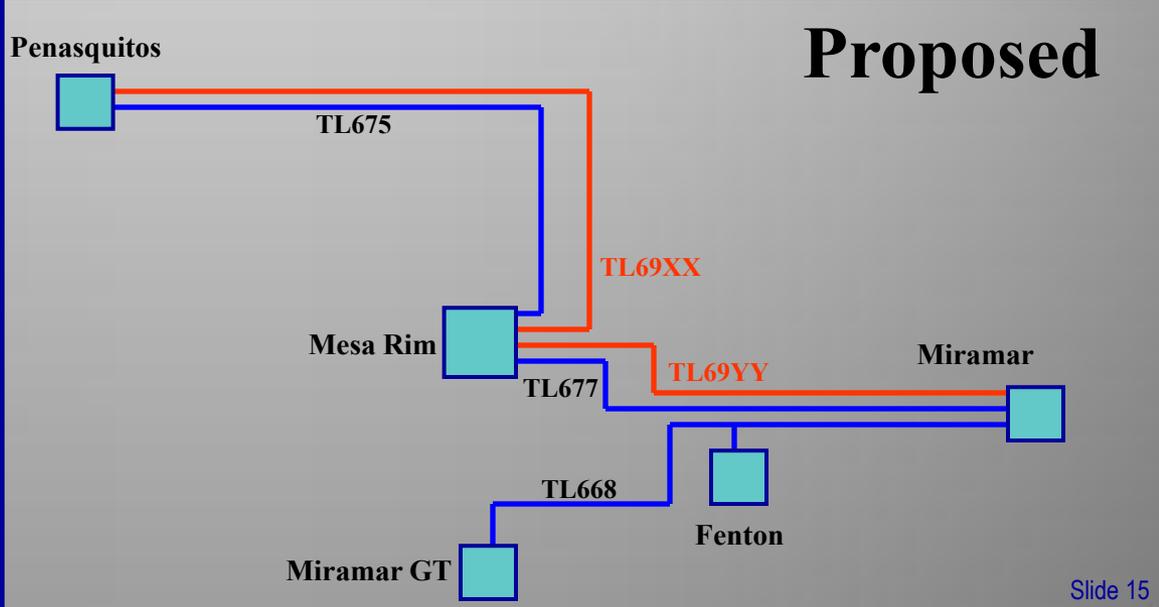
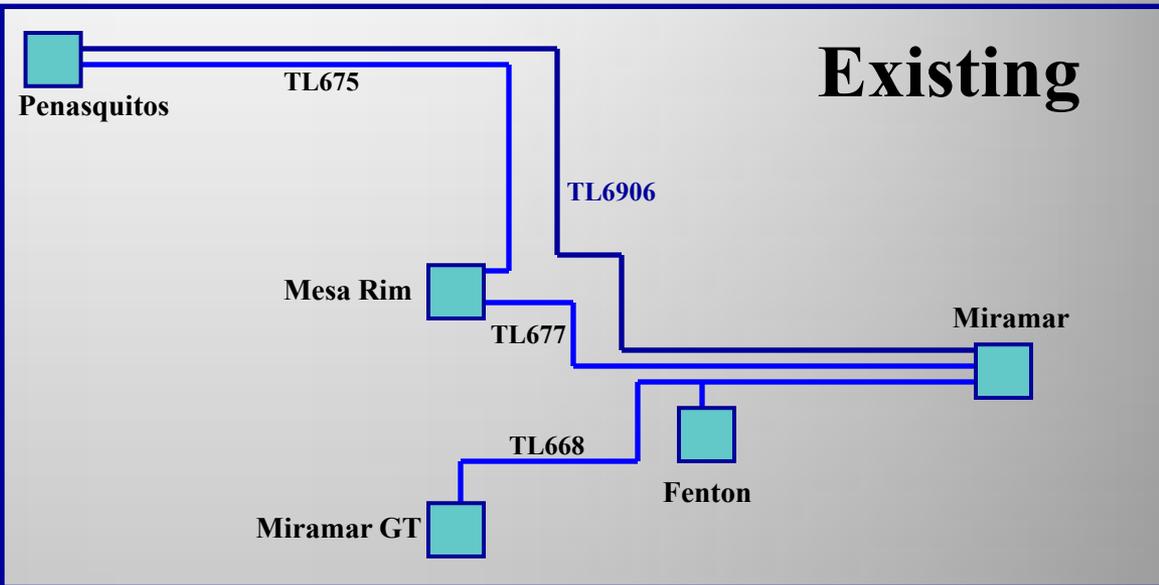
## • Cost: \$19 - \$24 Million

## • ISD: 2015



# TL6906: Penasquitos – Miramar Loop-In at Mesa Rim

- **Driving Factors:**
  - Mesa Rim is on Grid Ops substation watch list with 100+ MW of load (11,293 customers) at risk.
  - Serving Critical loads including Medical, Commercial, and Industrial customers.
  - Mesa Rim load was interrupted twice in July 2011.
  - Loop-in provides two additional sources.
- **Scope:**
  - Open TL6906 and loop it into Mesa Rim.
- **Cost: \$5 - \$7 Million**
- **ISD: 2015**



# TL13820 Sycamore – Chicarita: Reconductor



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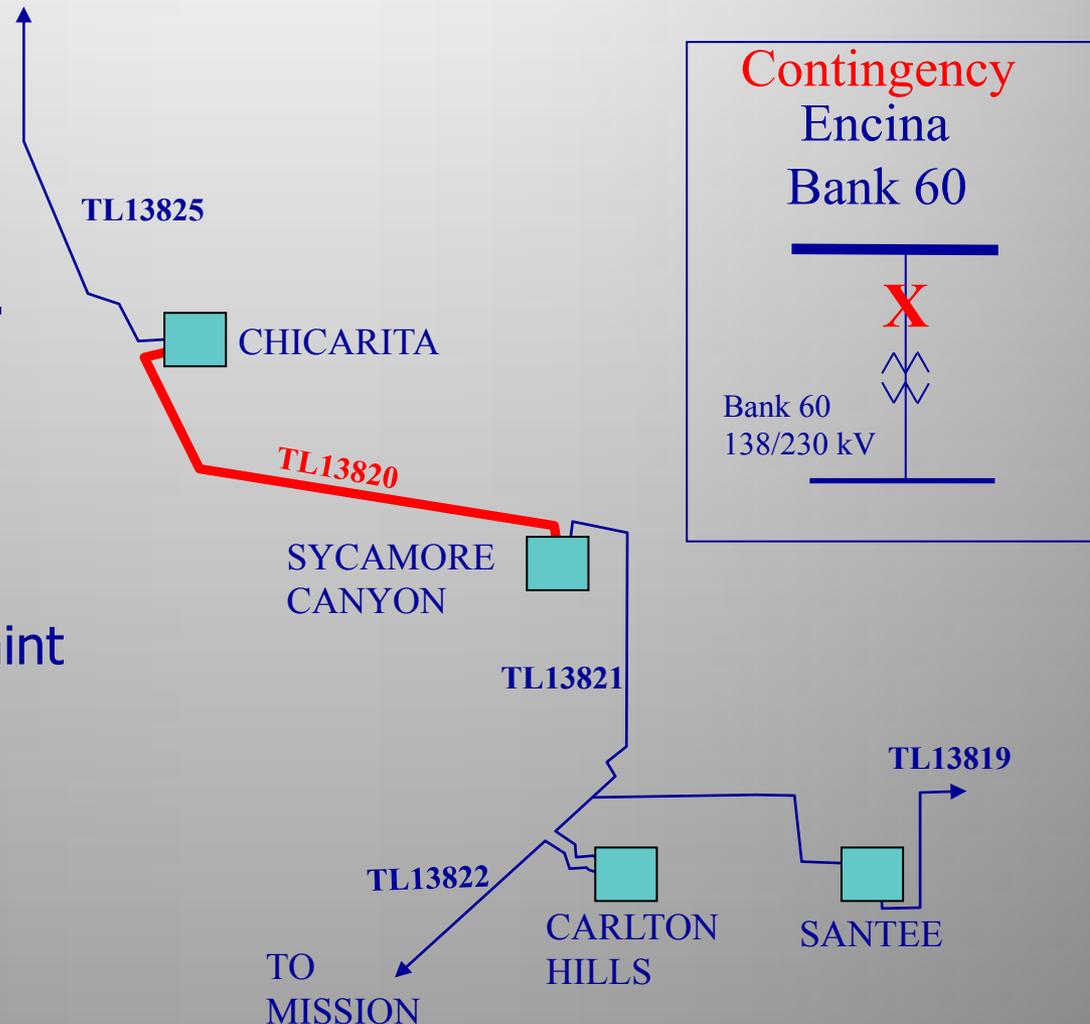
- N-1 overload starting in 2021:
  - TL13820 Sycamore Canyon – Chicarita 138kV

- Mitigation Scope:
  - Upgrade Substation Getaways – UG cable.

- Cost: \$0.5 – \$1 Million.

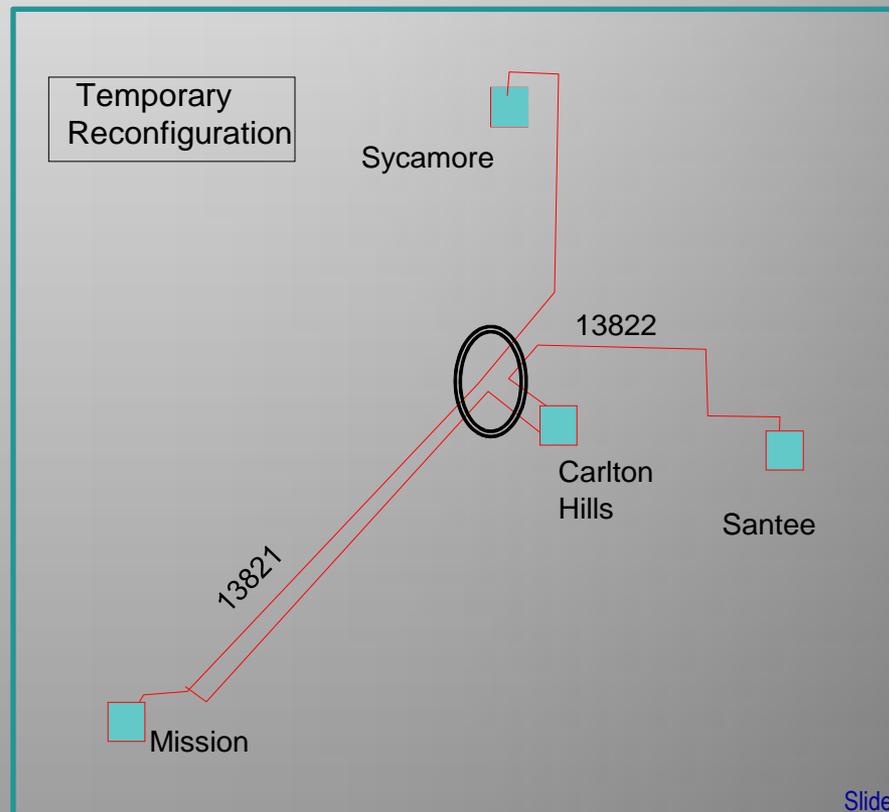
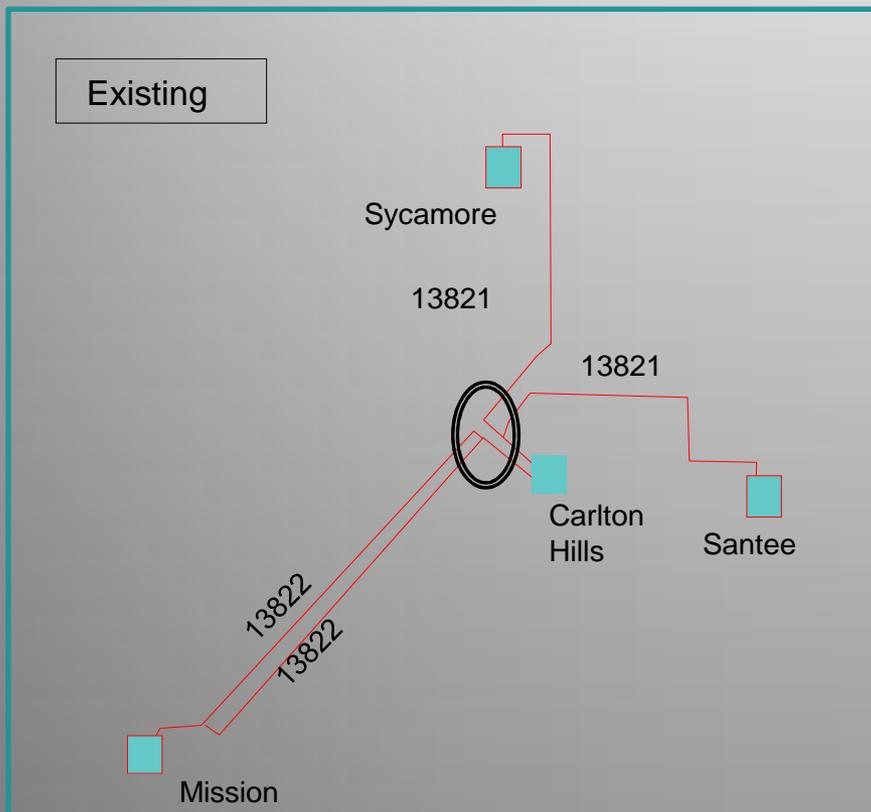
- ISD: 2014

- Additional benefits:
  - Eliminates the constraint for the Encina Sub-area.
  - Reduces LCR cost.



# TL13821 Temporary Reconfiguration

- Driving Factor:
  - Overloads on TL13821 for the outage of TL50001 until the Fanita Junction/Carlton Hills Tap Loop-In project is completed.
- Scope:
  - Temporary reconfiguration of TL13821 to create a Sycamore-Mission-Carlton Hills 3-terminal line.
- Cost: <\$100k; ISD: ASAP



# Reactive Support 230kV

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- Scope:

Add +/- 240MVAR reactive power sources at Sycamore, Mission, Penasquitos, and Talega Substation's 230kV Bus.

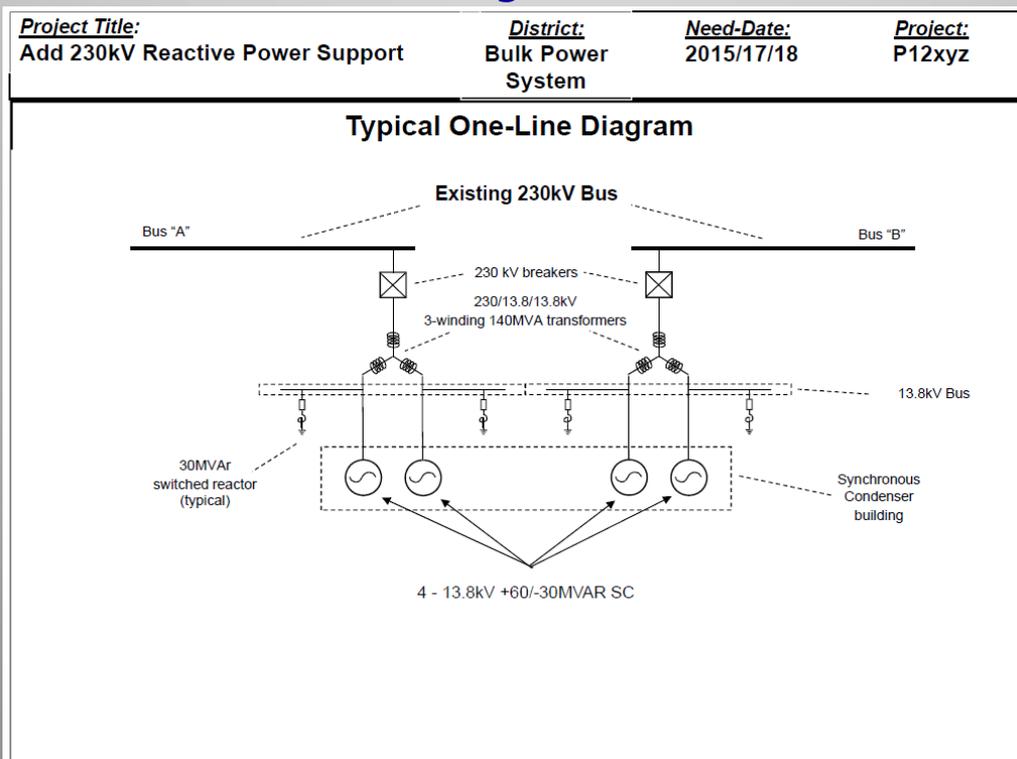
- Driving Factors:

- Meet NERC/WECC reactive margin criteria.
- Dynamic reactive capability & inertia:
  - South Bay (Retired in 2010)
  - Encina (Possible 2017 retirement & OTC)
  - SONGS is currently OOS, possible future OTC Retirement
- Need for improved voltage control pre and post contingency:
  - Maintains voltage stability, particularly with high system imports.
  - Regulates grid voltage for all system loading conditions.
  - Voltage/VAR control independent of unit commitment /dispatch.
  - NUC-001 requires following narrow voltage band at San Onofre bus.
- Improves San Diego Import Capability.

# Reactive Support 230kV (cont'd)

## Scope:

- 4 x +60/-30 MVAR Synchronous Condensers operated at 13.8 kV
- 4 x 30 MVAR, 13.8 kV switched shunt reactors
- 2 x 140 MVA 230/13.8/13.8 kV, 3-winding transformers
- 2 x 230 kV breakers, disconnects, & UG cable ties to 230 kV bus sections
- Relaying, controls, RTU points for control/monitoring
- Enclosed 15 kV metalclad switchgear



## Additional Benefits:

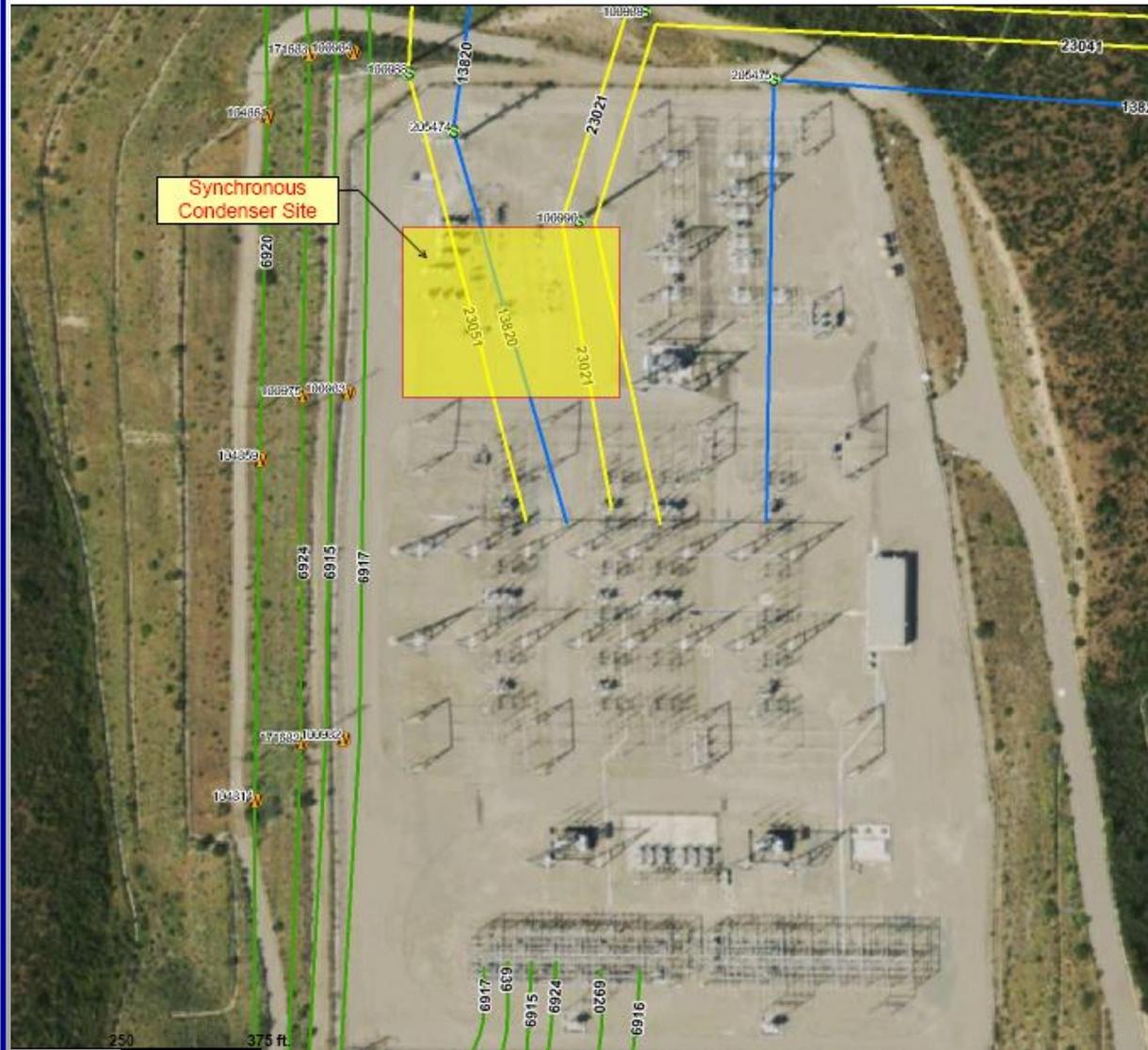
- Mitigates extreme system voltages.

Cost: \$56 - \$70 Million.

## Alternatives:

- SVCs
- STATCOM

Sycamore Canyon Synchronous Condenser Site



**Cost:** \$58 - \$72 Million.

**Alternatives:**

- SVCs
- STATCOM

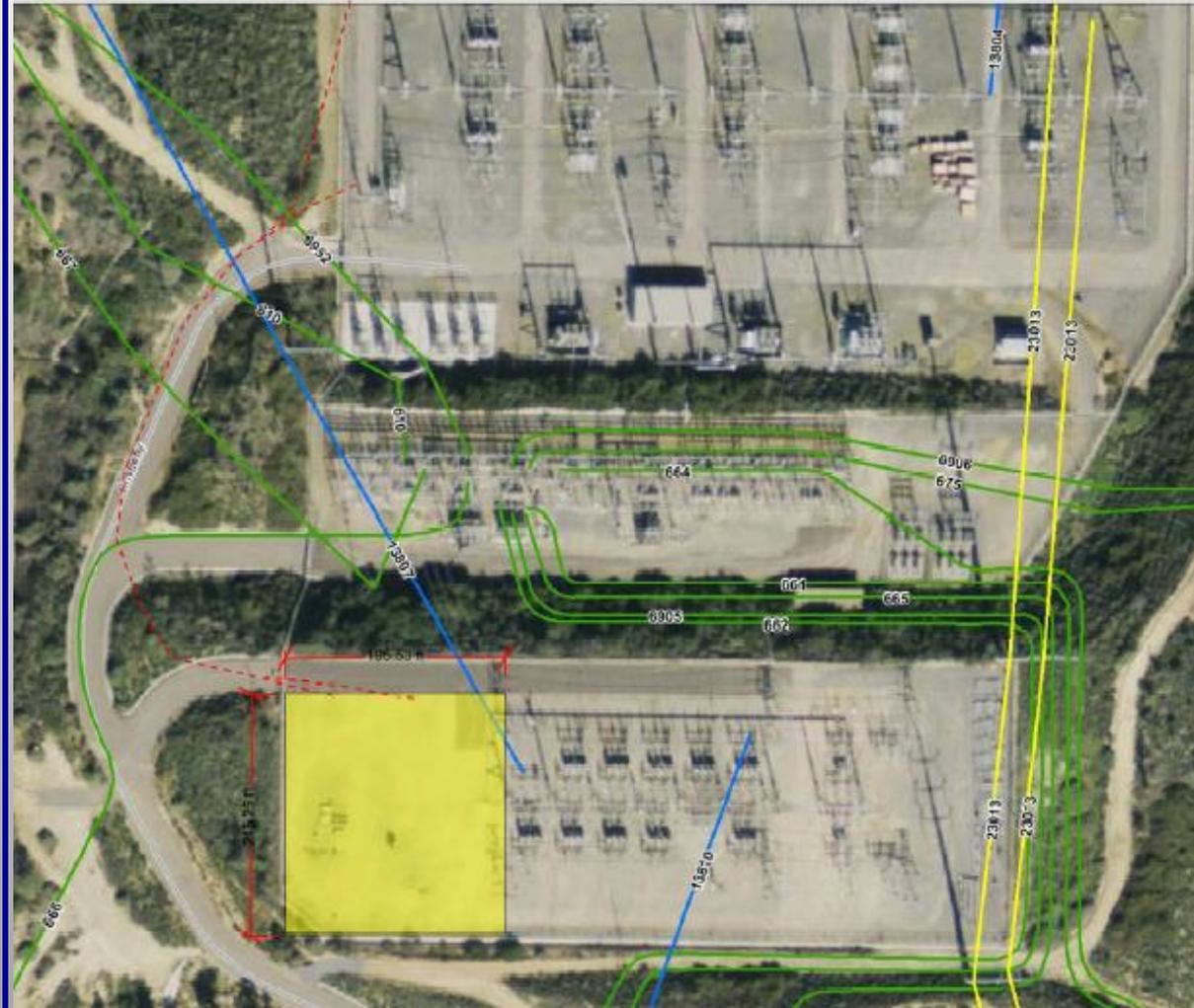


**Cost:** \$56 - \$70 Million.

**Alternatives:**

- SVCs
- STATCOM

**Penasquitos Synchronous Condenser Site**



**Additional Benefits:**

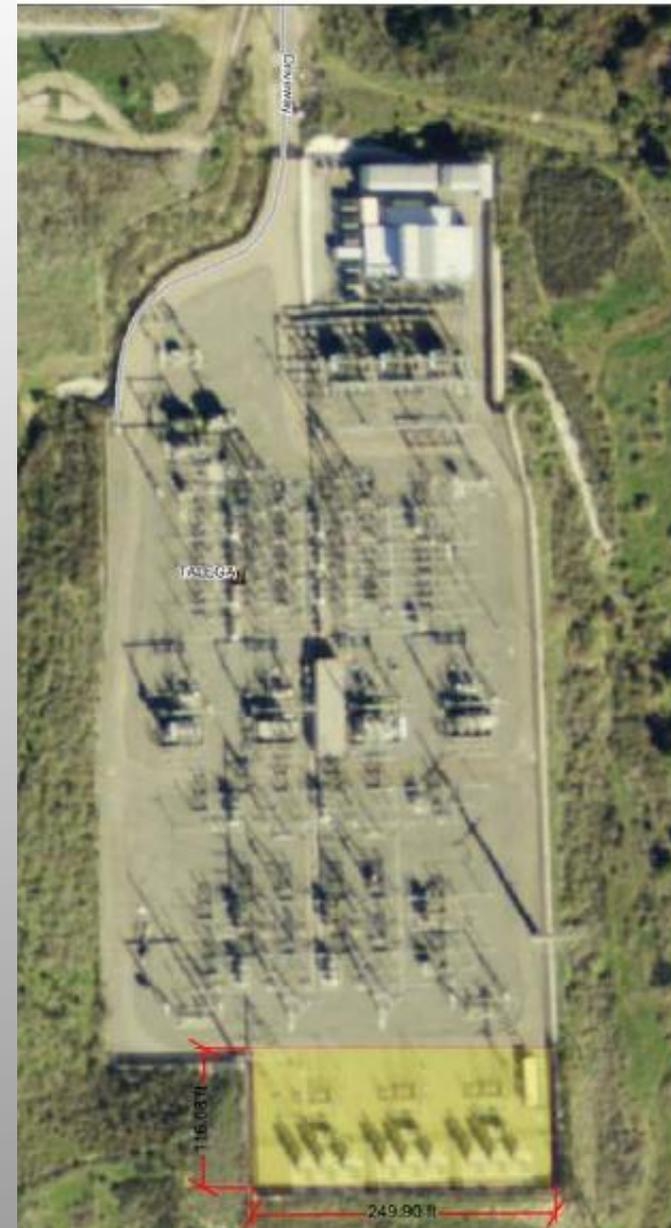
-Enhance operators' ability to maintain the SONGS 230 kV bus voltage within the narrow prescribed limits.

**Cost:** \$58 – \$72 Million.

**Alternatives:**

- SVCs
- STATCOM is not feasible at Talega site

**Talega Synchronous Condenser Site**



# New 230kV Sycamore - Penasquitos Line

## Background:

- Originally a part of the Sunrise Power Link project.

## Driving Factors:

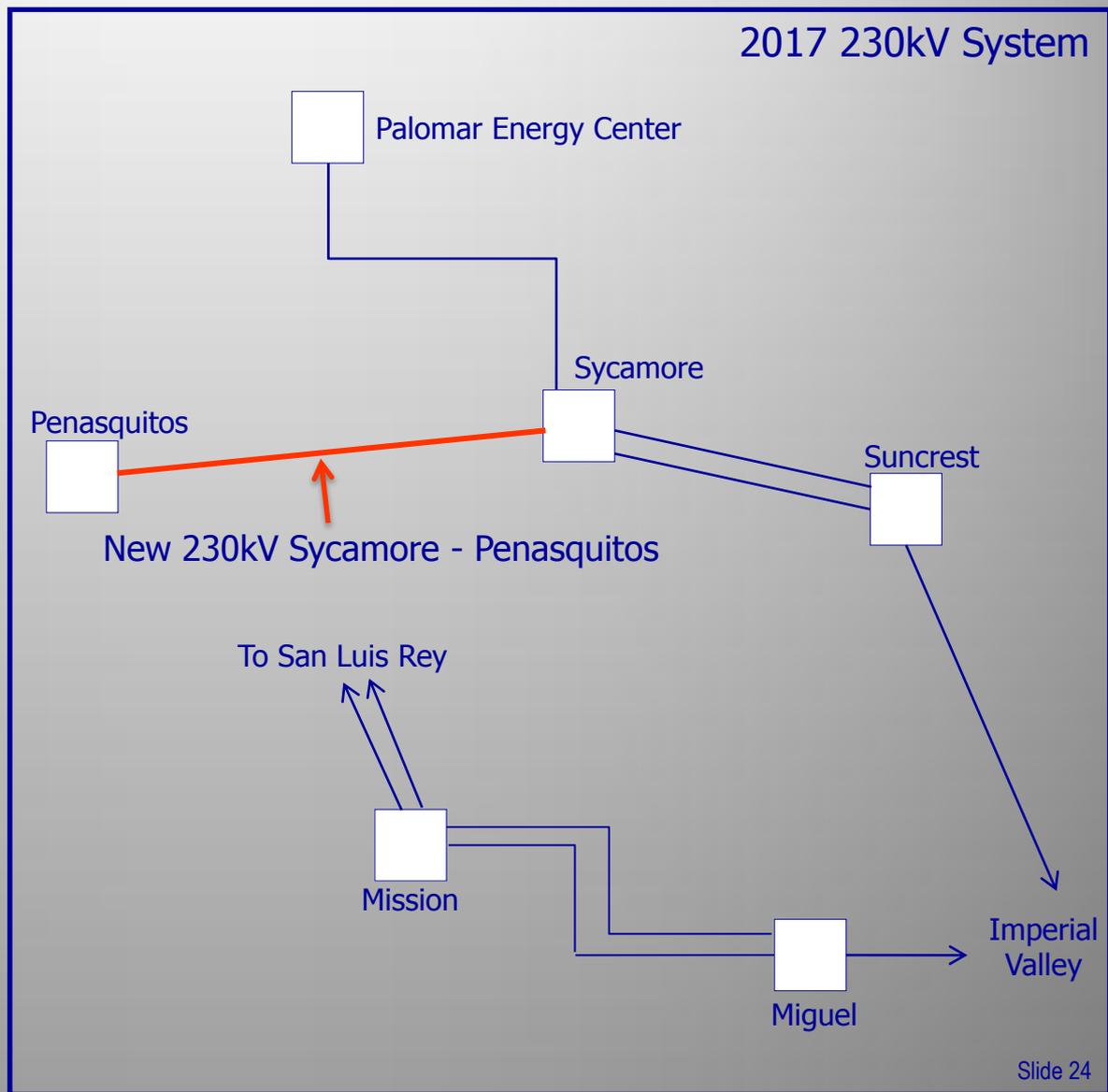
- "NO-SONGS" study indicates benefits.
- Additional Sycamore 230kV outlet.
- Delivers more power to coastal load center.
- Alleviates multiple Cat. B and C overloads.
- Reinforces SDG&E import capability.
- Renewable integration.

## Scope:

- Construct a new 230kV line from Sycamore to Penasquitos 230kV Substations. (ISD 2017)

## Cost:

~\$111 - \$221 Million



# Los Coches 230kV Expansion

## Driving Factors:

- Congestion at Sycamore.
- Multiple Cat. B and C overloads.

## Scope:

- Build 230kV substation at Los Coches
- Loop-in 230 kV TL23021 [Miguel - Sycamore] line.
- Tie Sycamore end of TL23021 to TL23055 to form Los Coches - Suncrest 230 kV line.

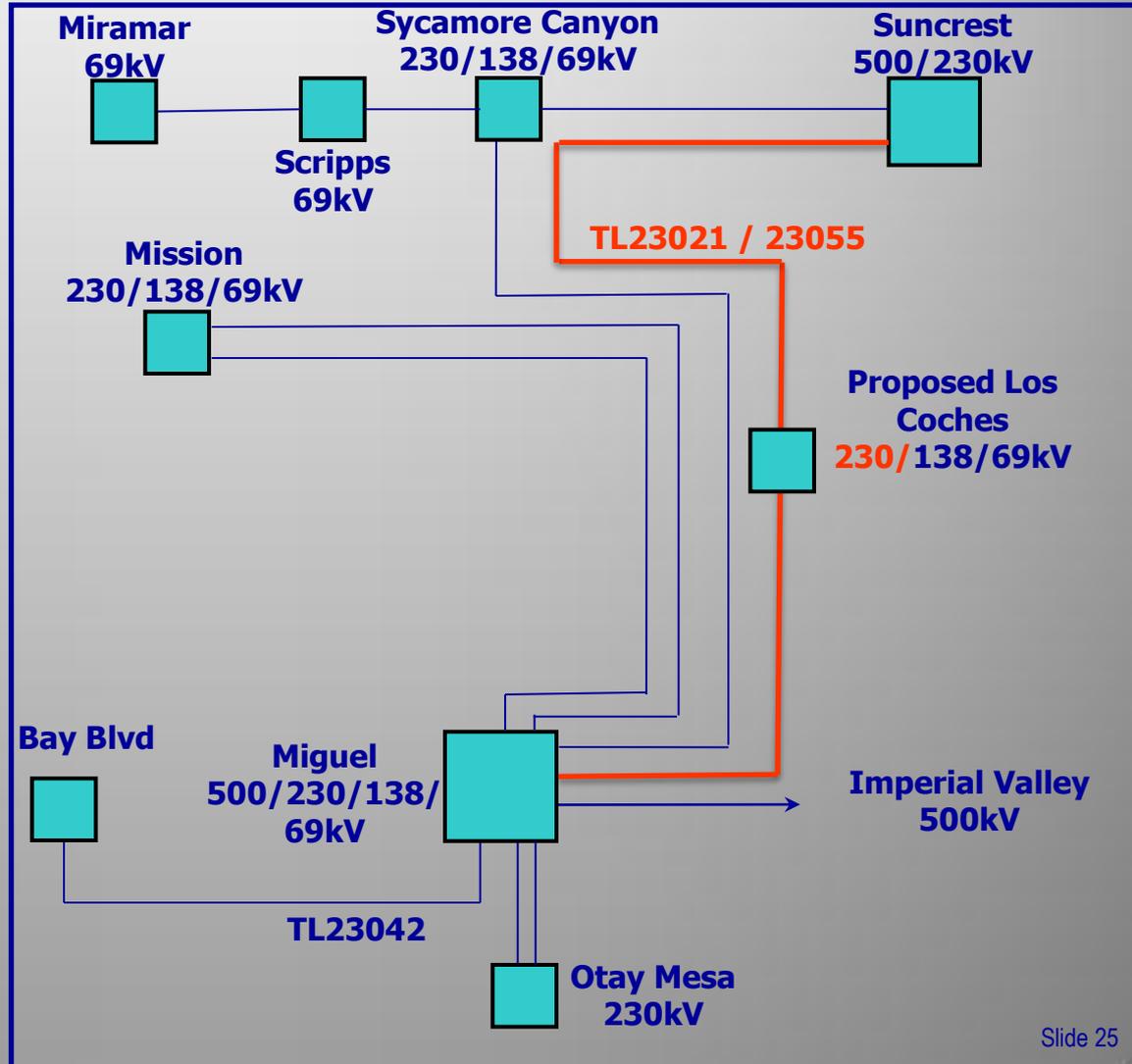
## Benefits:

- Deliver generation & imports closer to load center.
- Offload Sycamore 230 kV power injection.
- Reduce Sycamore congestion on 69 kV facilities.
- Increase operating flexibility.
- Facilitates 2nd outlet from Sunrise to support the renewable integration.

**Cost:** \$80 - \$120 Million. (ISD 2017)

## Alternative:

- Continue to upgrade existing 138kV and 69kV lines in Sycamore area.



# New Imperial Valley-IID Flow Control Device

## Driving Factors:

- High levels of renewable generation planned for interconnection to the CAISO controlled grid in the Imperial Valley area may impact the IID system.

## Benefits:

- Allows an increase in the amount of renewable generation that can interconnect to the southwestern 500kV transmission system by controlling SDG&E to IID flow.
- Studies show no major impact to CFE's system with the addition of the phase shifter.
- Both short and long term studies show that overloads on IID's system due to renewable integration are mitigated by the addition of the phase shifter.

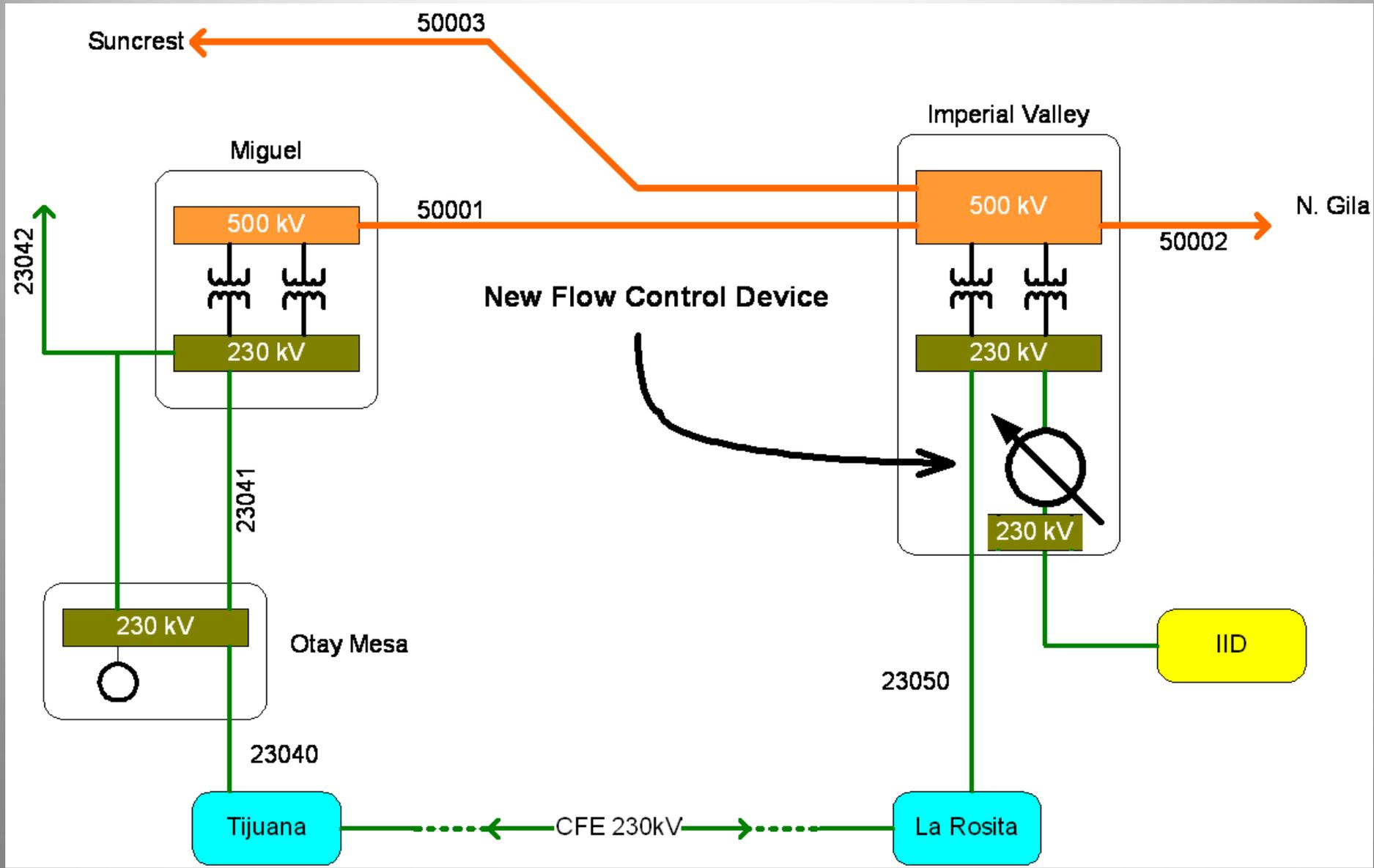
## Scope:

- Install Phase Shifting Transformer
  - 500 MVA +/- 45 deg
- Cost: \$20 - \$40 Million (ISD 2014)

## Alternatives:

- Variable Frequency Transformer
- Back-to-Back HVDC

# New Imperial Valley-IID Flow Control Device



# Category C Contingencies

- Construction of the proposed projects, implementing SPS, or operating procedures designed to drop load, would mitigate all identified Category C contingencies.

# Questions?

- ***Send comments to:***

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