Agenda – Day 1
Preliminary Reliability Assessment Results

Kristina Osborne
Stakeholder Engagement and Policy Specialist

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

2014-2015 Transmission Planning Process Stakeholder Meeting - Today's Agenda

Topic	Presenter
Introduction & Overview	Neil Millar - ISO
Preliminary Reliability Results for PG&E Area	ISO Regional Transmission Engineers
San Francisco Peninsula, Extreme Event Assessment	Jeff Billinton – ISO Luther Dow - Quanta
Preliminary Reliability Results for VEA, SCE and SDG&E Areas	ISO Regional Transmission Engineers
Harry Allen – Eldorado 500 kV Project Evaluation (and Development of 2014-2015 Simulation Model)	Luba Kravchuk- ISO
Wrap-up & Next Steps	Kristina Osborne- ISO

California ISO
Shaping a Renewed Future

Introduction and Overview
Preliminary Reliability Assessment Results

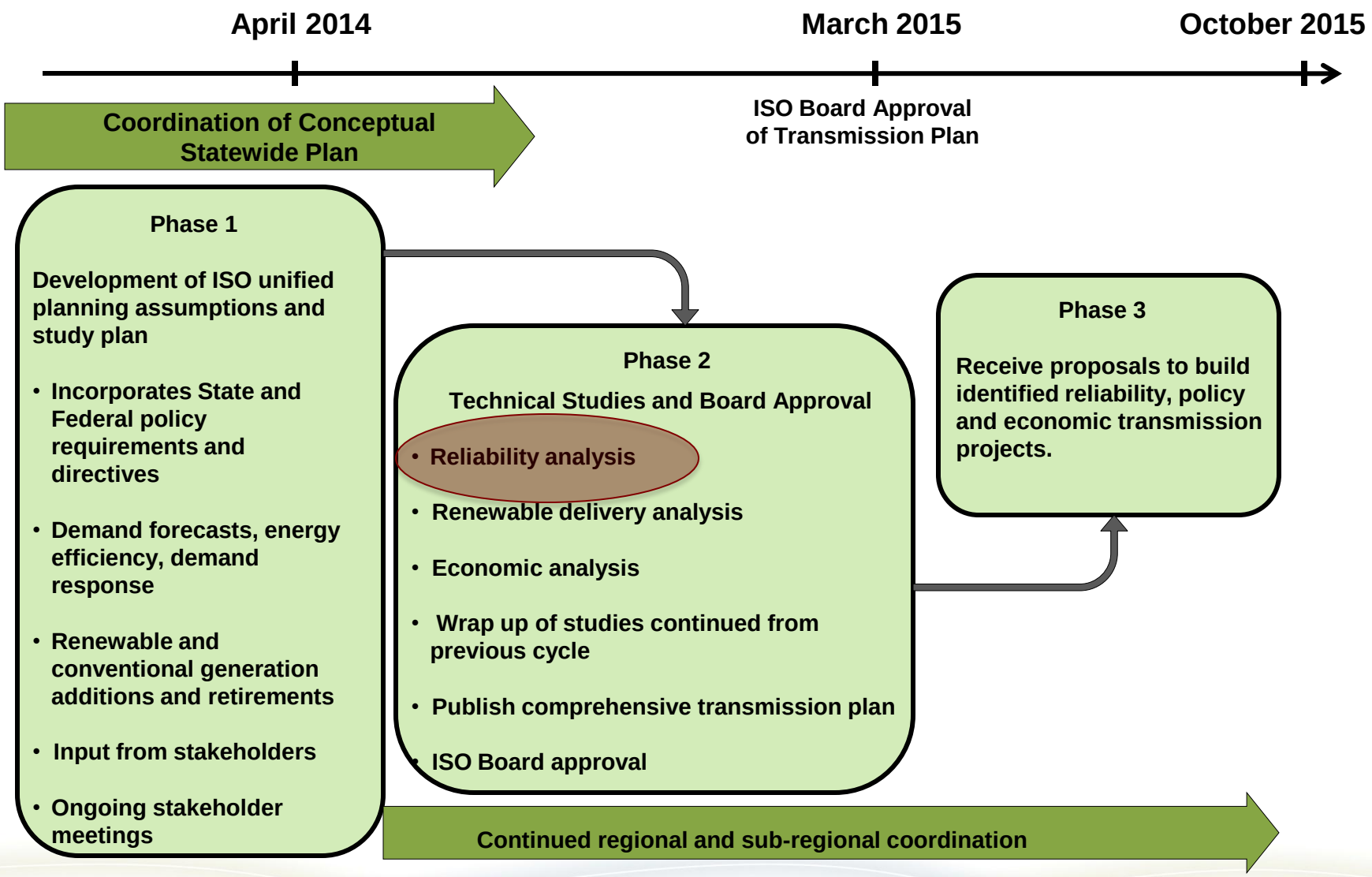
Neil Millar
Executive Director - Infrastructure Development

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Overview

- Process
- Critical Energy Infrastructure Information
- Non-conventional alternatives
- Ongoing studies and related consultation
  - San Francisco Peninsula study
  - Harry Allen – Eldorado study plan (extension of 2013-2014)
  - Imperial area consultation / Southern California needs
- Transmission Access Charge
- Conceptual statewide plan

2014-2015 Transmission Planning Cycle



2014-2015 Ten Year Reliability Assessment To Date

- Preliminary study results were posted on August 15
  - Based on assumptions identified in Study Plan
  - Satisfy requirements of:
    - NERC Reliability Standards
    - WECC Regional Criteria
    - ISO Planning Standards – modified September 18
- Transmission request window opened August 15
  - Reliability driven projects
- PTO proposed mitigations
  - Submitted to ISO September 15

2014-2015 Ten Year Reliability Assessment going forward

- Request window
  - Closes October 15
- ISO recommended projects:
  - For management approval of reliability projects less than $50 million will be presented at November stakeholder session
  - For Board of Governor approval of reliability projects over $50 will be included in draft plan to be issued for stakeholder comments by January 31, 2013
- Purpose of today's stakeholder meeting
  - Review the results of the reliability analysis
  - Set stage for stakeholder feedback on potential mitigations

Critical Energy Infrastructure Information

- The ISO is re-evaluating its CEII practices to ensure they remain sufficient going forward.
- Continuing with steps established in previous years:
  - Continuing to not post category D contingency discussions in general - only shared on an exception basis where mitigations are being considered:
    - Details on secure web site
    - Summaries on public site
  - Continuing to migrating planning material over 1 year old to the secure website.
- One “bulk system” presentation and the San Francisco Peninsula presentations for today have also been posted on the secure site.

Studies continuing from previous planning cycle – San Francisco Peninsula Reliability Project

- Building on previous years' analysis, the studies are continuing as part of the 2014/2015 planning process
- The studies continue to focus on category D (or beyond) extreme contingencies
- Planning standards amended on September 18 to provide greater clarity and transparency on issue
- Previous years' analysis focuses on risks and potential mitigations; this year's analysis is focusing on whether the overall "best" mitigation provides sufficient benefit to proceed
- Study scope will be reviewed later today

Studies continuing from previous planning cycle - Harry Allen-Eldorado Transmission Project

- Project is continuing as an extension of the 2013/2014 transmission planning cycle, as requiring further study.
- NV Energy announcement necessitated re-doing studies modeling NV Energy participation in ISO energy imbalance market
- Continuing the studies in progress, leveraging this stakeholder consultation opportunity
- Study plan being presented today
  - standalone results stakeholder event in October or November
  - recommendation to Board of Governors in December
- Note that the economic study assumptions used in this study will also be used in 2014-2015 economic studies

Imperial area consultation / Southern California needs

- Discussion paper and July 14 stakeholder session focused on specific issues that would support the development of the 2014/2015 transmission plan
- Potential need associated with further potential reliability needs in Southern California and policy-related renewable generation development in Imperial area
- Note that preliminary reliability assessment does not show a residual reliability need in Southern California
- ISO will be continuing Imperial area consultation to support consideration of backup alternatives in Southern California and the sensitivity analysis of additional renewable generation development in the Imperial area
- Updated paper on October 1, stakeholder meeting on October 8

Alternatives to Transmission or Conventional Generation Methodology

- In last year's 2013/2014 cycle - the focus was on identifying the necessary characteristics as part of a basket of resources in the LA Basin and San Diego areas.
- In this 2014/2015 cycle – looking to broaden consideration into other areas.
- The ISO is also participating in numerous activities exploring related issues, including:
  - CPUC distributed energy resources proceeding
  - Energy storage roadmap
  - CEC and CPUC processes assessing load modifying resources
  - Refinements to energy storage interconnection processes
  - Refinements to demand response products and processes

Draft Conceptual Statewide Plan has been posted for stakeholder review and comment

- Previous years have primarily relied upon CTPG annual report
  - CTPG activities currently on hold with FERC Order 1000
- This year's draft plan is based on previous CTPG report updated with publicly available information
- Comment period to October 20th

High Voltage Transmission Access Charge Estimating Model

- The 2013-2014 TPP model was posted and a stakeholder call held on May 8, 2014
- Comments have been received for possible future refinements, and are being considered
- The model will be updated in late 2014 for January 2015 posting of draft transmission plan

PG&E Bulk Transmission System Preliminary Reliability Assessment Results

Available on Market Participant Portal

Confidential – Subject to Transmission Planning NDA

Irina Green

Regional Transmission Engineering Lead

2014-2015 Transmission Planning Process Stakeholder Meeting

September 24-25, 2014

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Humboldt, North Coast & North Bay Areas Preliminary Reliability Assessment Results

Rajeev Annaluru
Senior Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Humboldt Area

- 3000 sq. miles. NW corner of PG&E
- Cities: Eureka, Arcata, Garberville
- Generation - Humboldt Bay Power Plant , QFs, total 243 MW
- Voltage 115 kV – from Cottonwood, 60 kV – from Mendocino
- Winter peak 215 MW in 2024, summer peak 186 MW in 2024

Humboldt Area Assessment Summary

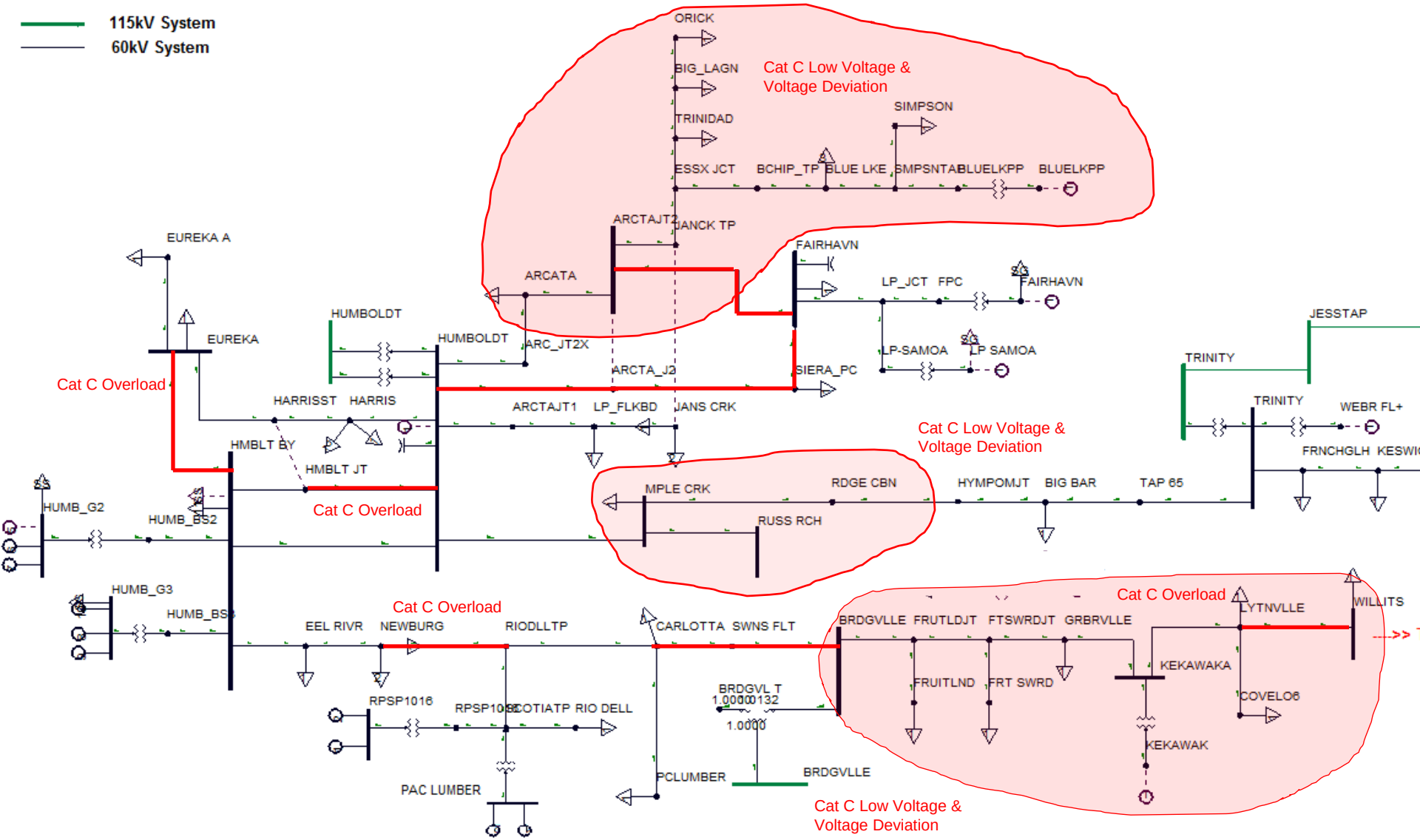
- The assessment identified:
  - Thermal overloads due to Category B - 4
  - Thermal overloads due to Category C - 8
  - Low voltage due to Category B – 2
  - Low voltage due to Category C – 1
- Compared to last year results:
  - All the major issues identified in this years analysis are similar to the issues identified last year.
  - One new potential reactive support project identified

Humboldt Area – Results (Category A & B)

- Thermal Overloads
  - Essex Jct - Arcata - Fairhaven 60kV line (Cat B, 2024)
  - Fairhaven - Humboldt 60kV line (Cat B, 2024)
    - Mitigation: Continue to dispatch Fairhaven / Blue lake generation
- Low Voltage
  - Arcata area 60kV (Cat B, 2024)
    - Potential Mitigation: May need a new 60kV cap bank in the 7-10 year timeframe
  - Maple Creek 60kV (Cat B, 2016)
    - Mitigation: Maple creek reactive support project
- Voltage Deviation
  - Arcata area 60kV (Cat B, 2024)
    - Potential Mitigation: May need a new 60kV cap bank in the 7-10 year timeframe
  - Maple Creek 60kV (Cat B, 2016)
    - Mitigation: Maple creek reactive support project

Category C problems will be discussed in the area diagram in next slide

Humboldt Area – Results (cont'd)



North Coast and North Bay Areas

- North of the Bay Area and south of Humboldt
- Sonoma, Mendocino, Lake, Marin and part of Napa and Sonoma counties – 10,000 sq. miles
- Cities – Laytonville, Petaluma, San Rafael, Novato, Benicia, Vallejo
- Generation- Geysers Power Plants and QFs, total 1620 MW
- 60kV, 115kV and 230 kV facilities
- Summer peak 1548 MW in 2024

North Coast / North Bay Area Assessment Summary

- The assessment identified:
  - Thermal overloads due to Category B – 8 and Category C - 32
  - Low voltages due to Category B – 4 and Category C - 4
  - Voltage deviations due to Category B - 2

- Compared to last year results:
  - All the major issues identified in this years analysis are similar to the issues identified last year.
  - One new potential reactive support project identified

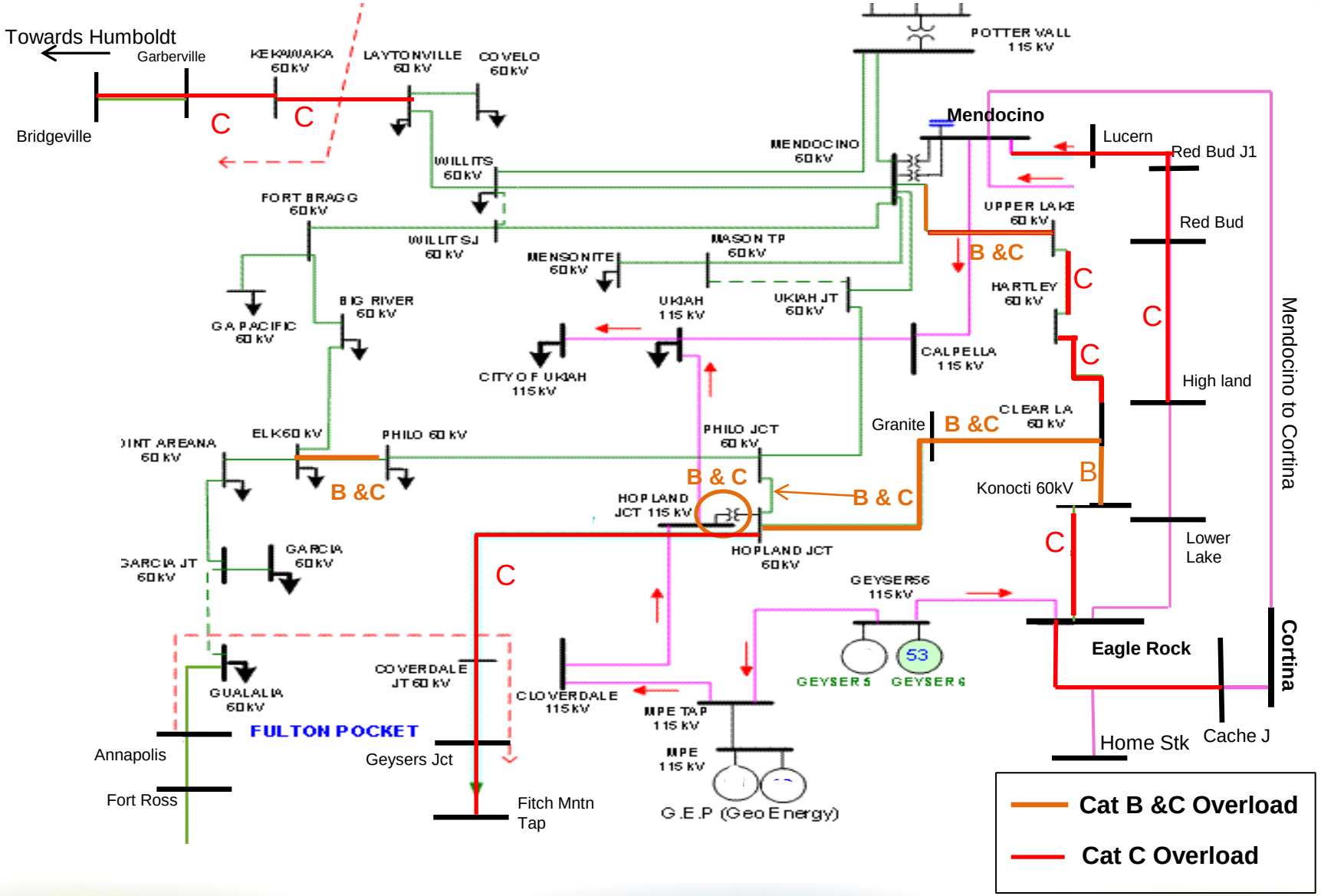
North Coast / North Bay Area – Results (Category B)

- Thermal Overloads
  - Mendocino - Clear Lake 60 kV Line #1(Cat B)
    - Mitigation – Clear Lake 60kV system reinforcement project
  - Clear Lake – Hopland 60kV line (Cat B)
    - Mitigation – Clear Lake 60kV system reinforcement project
  - Clear Lake – Eagle Rock 60kV line (Cat B)
    - Mitigation – Clear Lake 60kV system reinforcement project
  - Hopland 115/60kV transformer
    - Mitigation – Clear Lake 60kV system reinforcement project
  - Tulucay – Napa 60kV line #1 (Cat B)
    - Mitigation – Reconductor the line

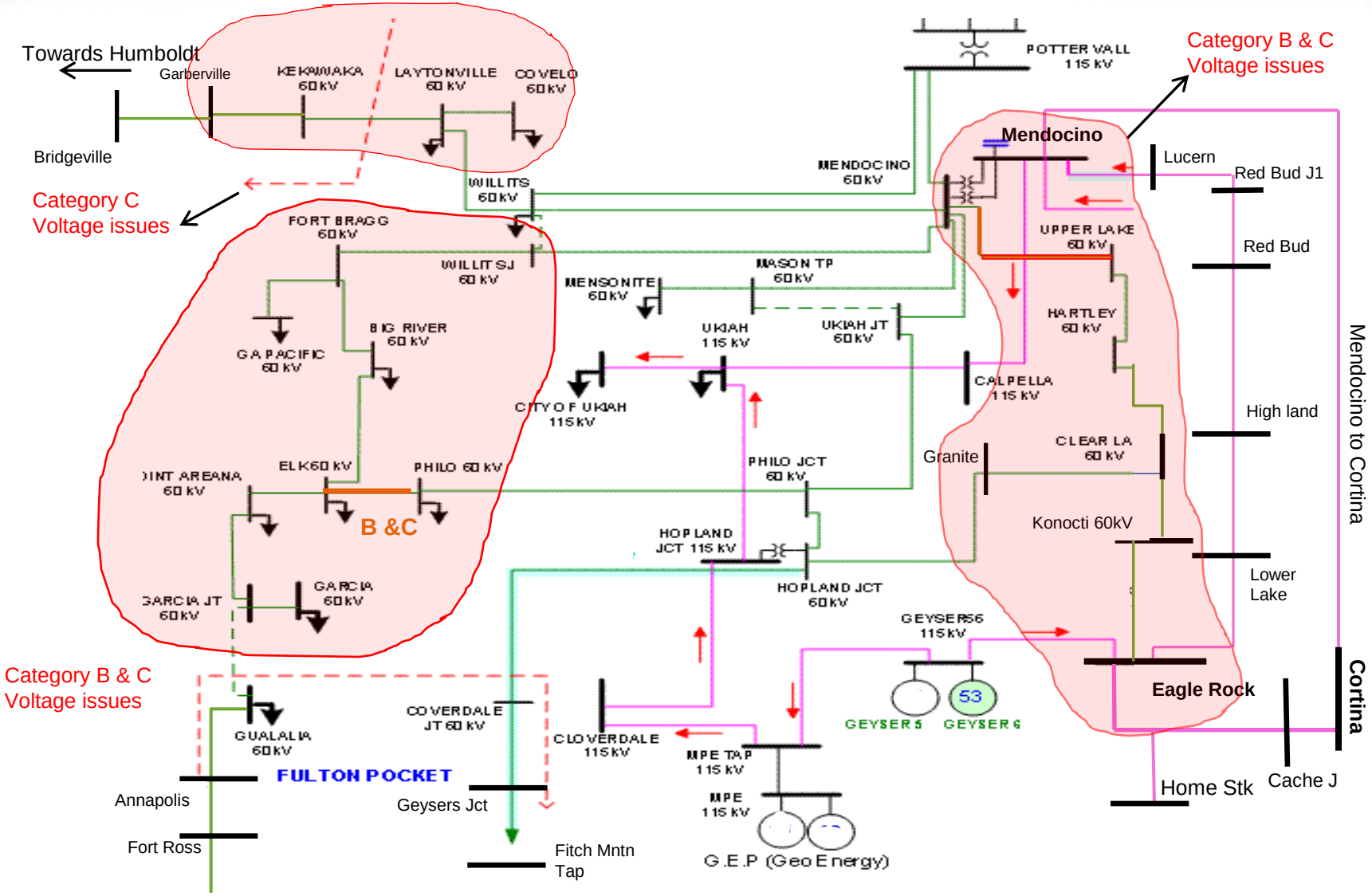
North Coast / North Bay Area – Results (Category B)

- Low Voltage
  - Clear Lake, Lower Lake, Konocti, Middle town (Cat B)
    - Mitigation – Clear Lake 60kV system reinforcement project
  - Fort Bragg, Willits, Mendocino (Cat B)
    - Potential Mitigation – Install new Capacitor bank
  - Greenbrae, Sausalito 60kV (Cat B)
    - Mitigation – Ignacio – Alto voltage conversion project
  - Elk, Garcia, Big River, Pnt Arena (Cat B)
    - Mitigation – Big River SVC
- Voltage Deviation
  - Clear Lake, Lower Lake, Konocti, Middle town, Calistoga, Dunbar, St. Helna (Cat B)
    - Mitigation – Clear Lake 60kV system reinforcement project
  - Elk, Garcia, Big River, Pnt Arena (Cat B)
    - Mitigation – Big River SVC

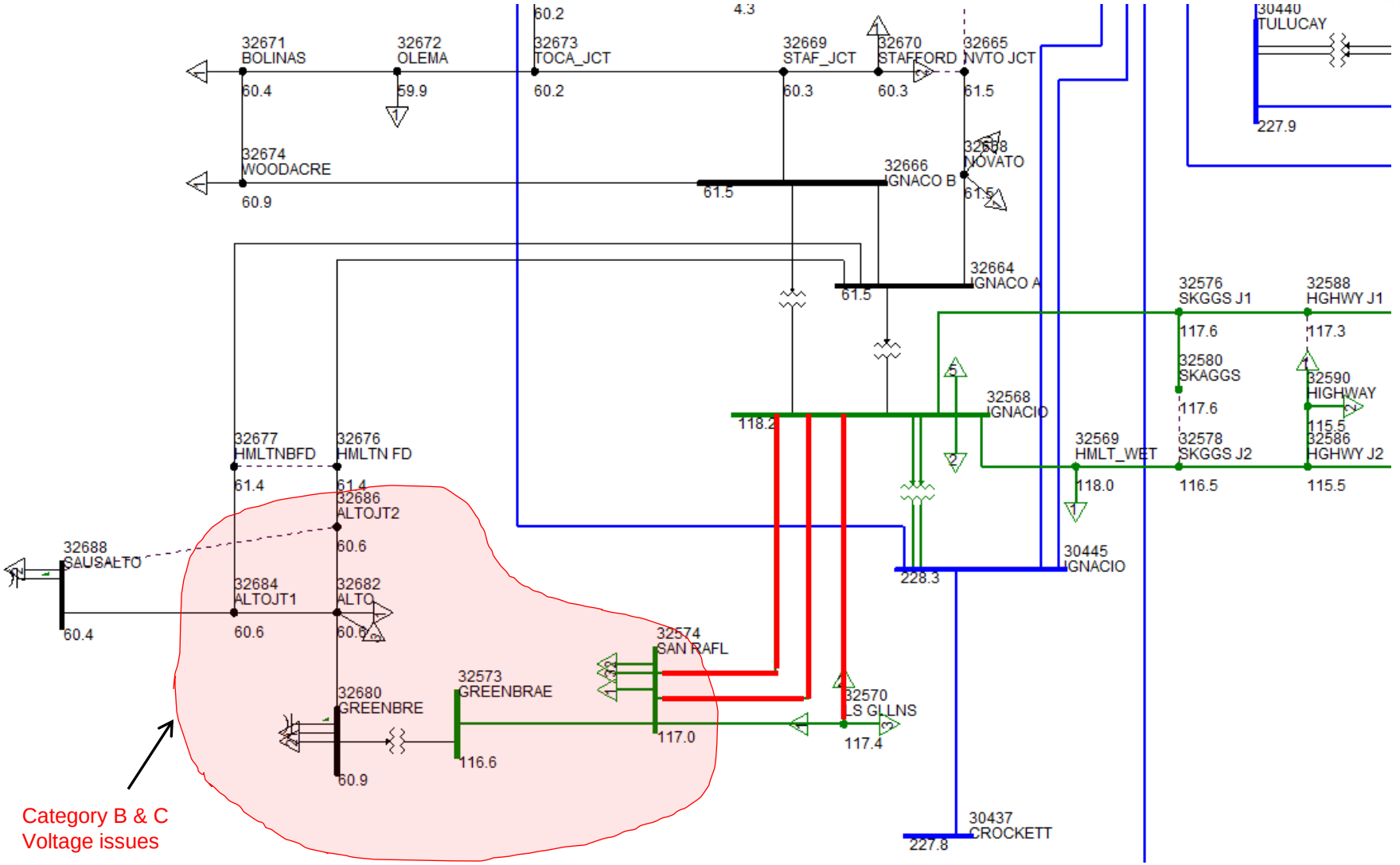
Mendocino - Eagle Rock Area Thermal Issues



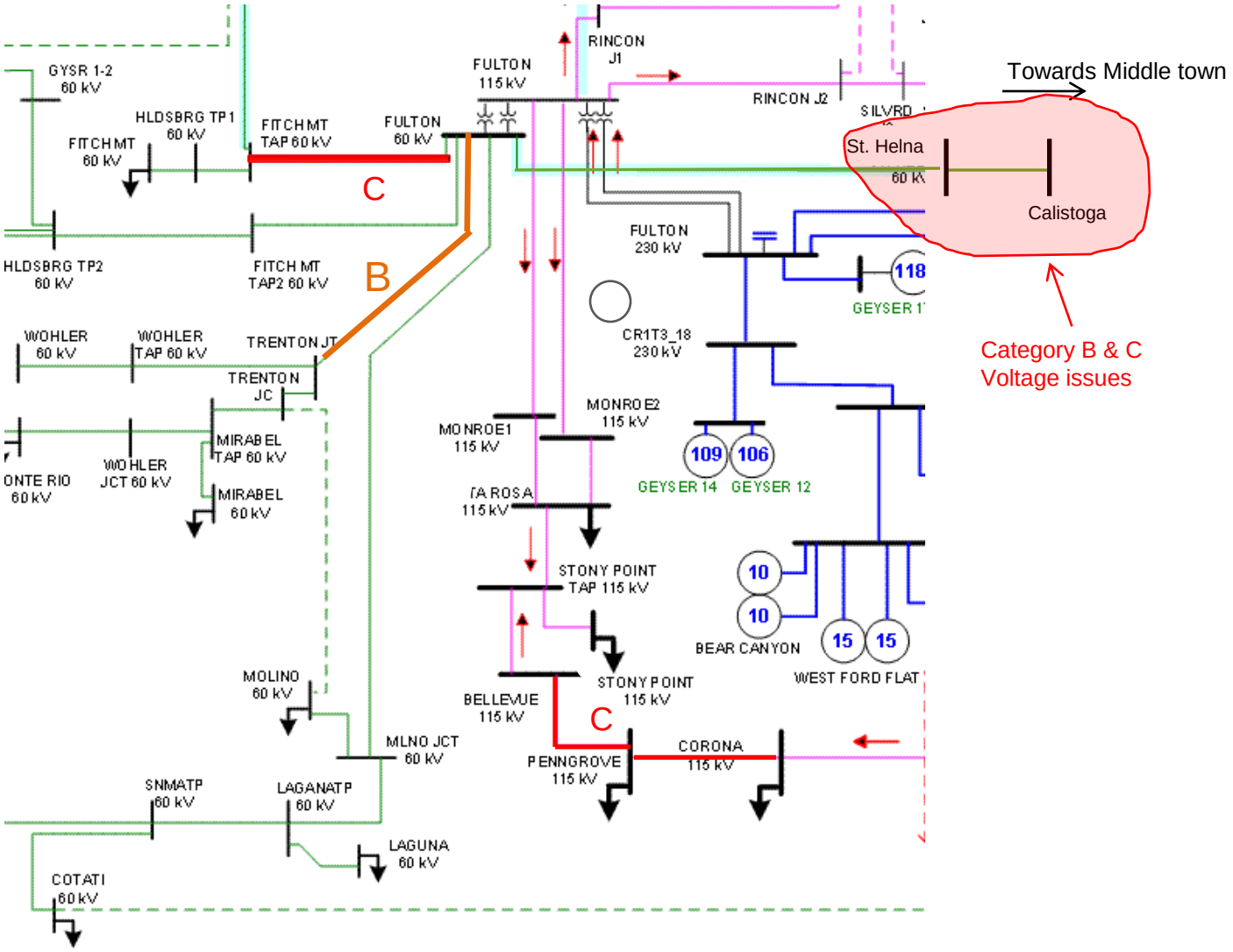
Mendocino - Eagle Rock Area Voltage Issues



Ignacio – Alto area issues



Fulton area issues

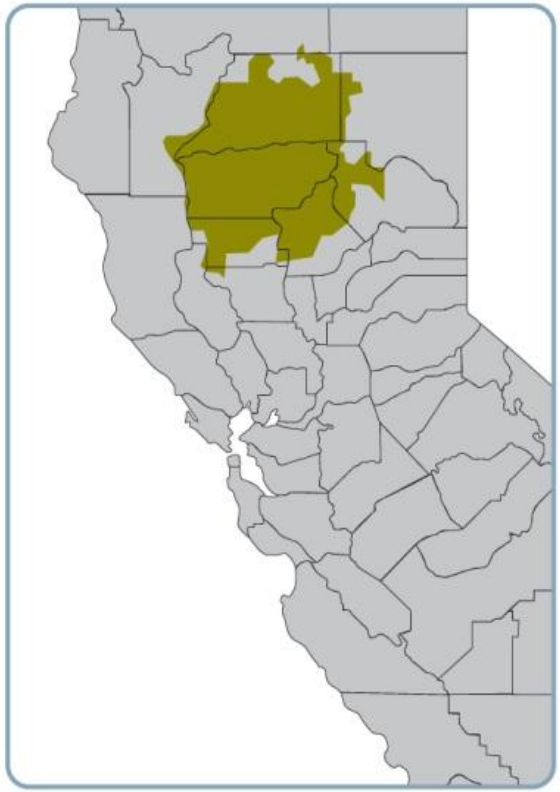


North Valley & Central Valley Areas Preliminary Reliability Assessment Results

Bryan Fong
Sr. Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

North Valley Area



- 15,000 sq. miles NE corner of PG&E
- Cities: Chico, Redding, Red Bluff, Paradise
- Generation: Over 2,000 MW of hydro. Colusa is the largest generation facility (717 MW).
- Comprised of 60, 115, 230 & 500 kV transmission facilities.
- Summer Peak 1,038 MW in 2024

North Valley Area Assessment Summary

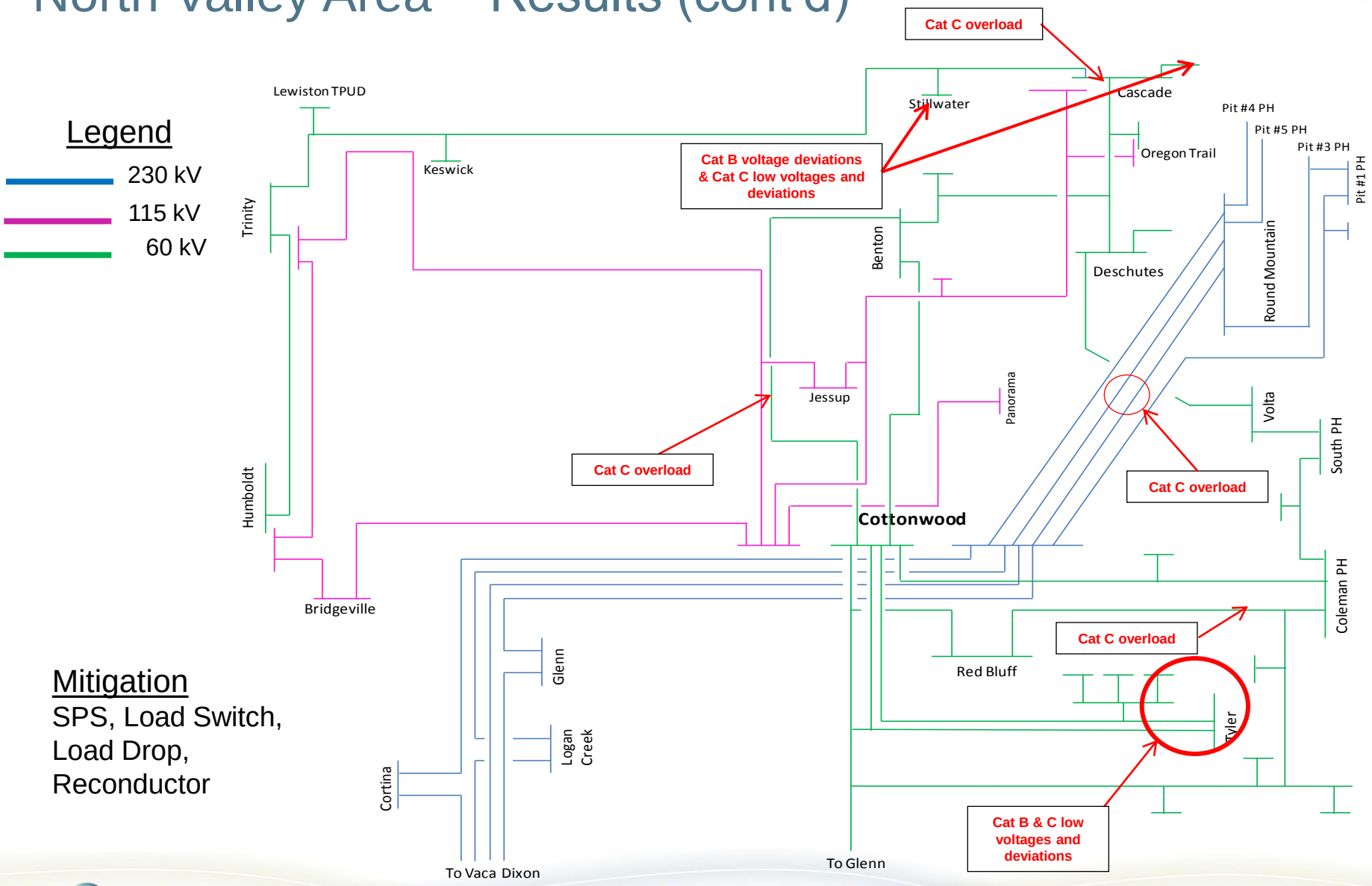
- The assessment identified:
  - Thermal overloads due to Category A - 1, Category B - 1 and Category C – 21
  - Low voltages due to Category B - 4 and Category C - 27
  - Voltage deviations due to Category B - 15 and Category C - 7
  - Low voltage at 60 kV buses only
  - Two Category C contingencies (Table Mountain and Cottonwood Stuck Breakers) resulted in divergence
- Compared to last year results:
  - 1 new overload (Glenn#3 60kV Line) under normal condition
  - Additional Spring Peak Scenario is studied in this year

North Valley Area – Results (Category A & B)

- Thermal Overloads
  - Glenn #3 60 kV Line (Cat A / 2016)
    - Potential Mitigation – Reconductor the line
  - Glenn #2 230/60kV Bank (Cat B / 2019)
    - Potential Mitigation – Close N/O switch (if possible) on Glenn #1 230/60kV Bank
- Low Voltage
  - Cascade and Red Bluff Area 60 kV (Cat B / 2016)
    - Potential Mitigation – load transfer and may need additional reactive support
- Voltage Deviation
  - Cascade and Red Bluff Areas 60 kV (Cat B / 2016)
    - Potential Mitigation – load transfer and may need additional reactive support

Category C problems will be discussed in the area diagram in next slide

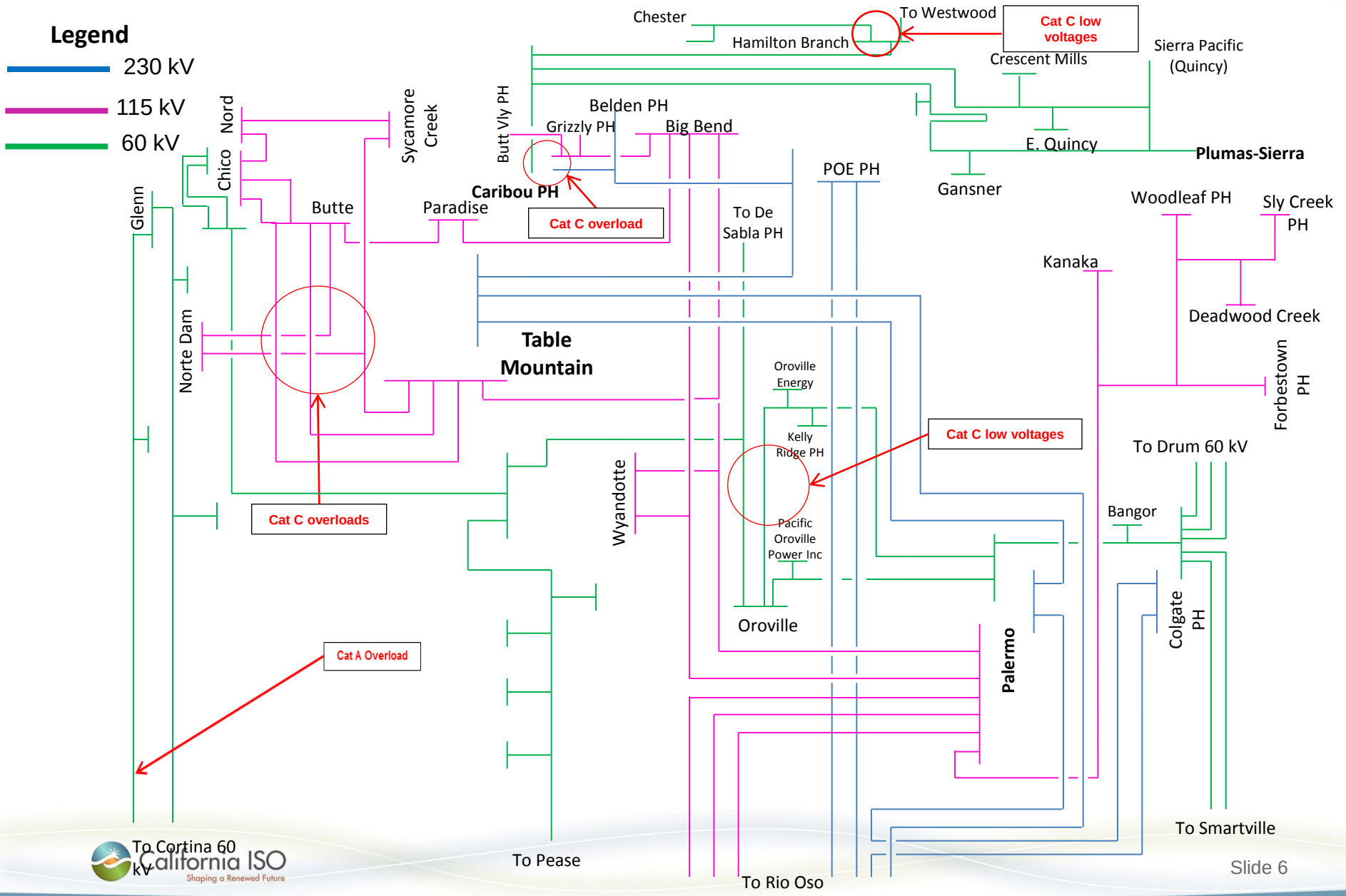
North Valley Area – Results (cont'd)



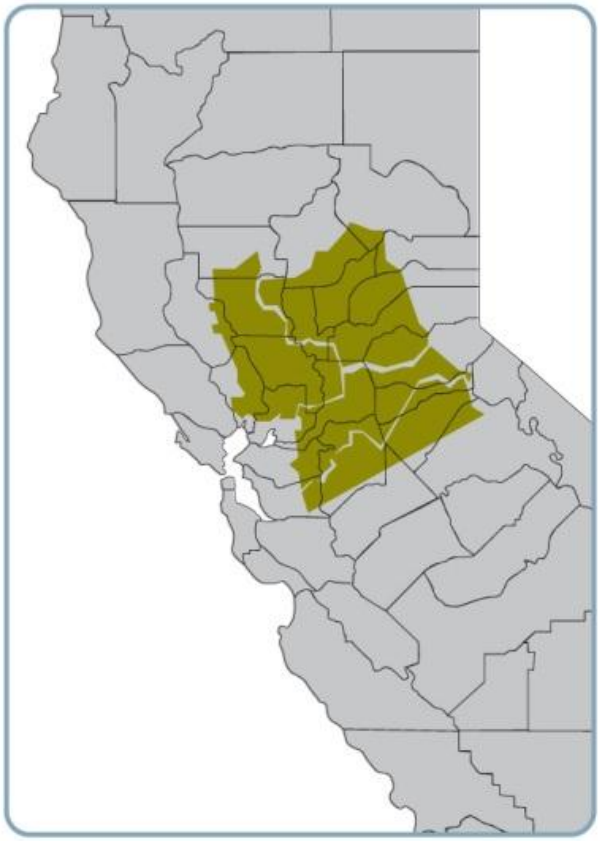
Mitigation

SPS, Load Switch, Load Drop, Reconductor

North Valley Area – Results (cont'd)



Central Valley Area



- Includes Sacramento, Sierra, Stockton & Stanislaus divisions
- Generation: Over 3,500 MW of generation
- Comprised of 60, 115, 230 & 500 kV transmission facilities.
- Summer Peak 4,476 MW in 2024

Sacramento Area Assessment Summary

- The assessment identified:
  - Thermal overloads due to Category B – 3 and Category C - 16
  - Low voltages due to Category C – 2
  - Voltage deviations due to Category B – 1 and Category C – 1
- Compared to last year results:
  - Same Category B thermal overload
  - Additional Spring Peak Scenario is studied in this year
  - Improvement in voltage in West Sac/Davis area 115 kV system

Sacramento Area – Results (Category A & B)

- Thermal Overloads
  - Brighton-Davis 115 kV line (Cat B / 2016)
    - Potential Mitigation – transferring load to adjacent Distribution Planning Areas until Vaca-Davis Voltage Conversion
  - Vaca Dixon 115/60 kV Transformer Bank #5 (Cat B / 2016)
    - Potential Mitigation – transferring load to adjacent Distribution Planning Areas until Vaca-Davis Voltage Conversion
  - Cortina 60 kV line #3 (Cat B / 2016)
    - Potential Mitigation – disabling the Arbuckle Automatics based on system conditions during high loading periods

Category C problems will be discussed in the area diagram

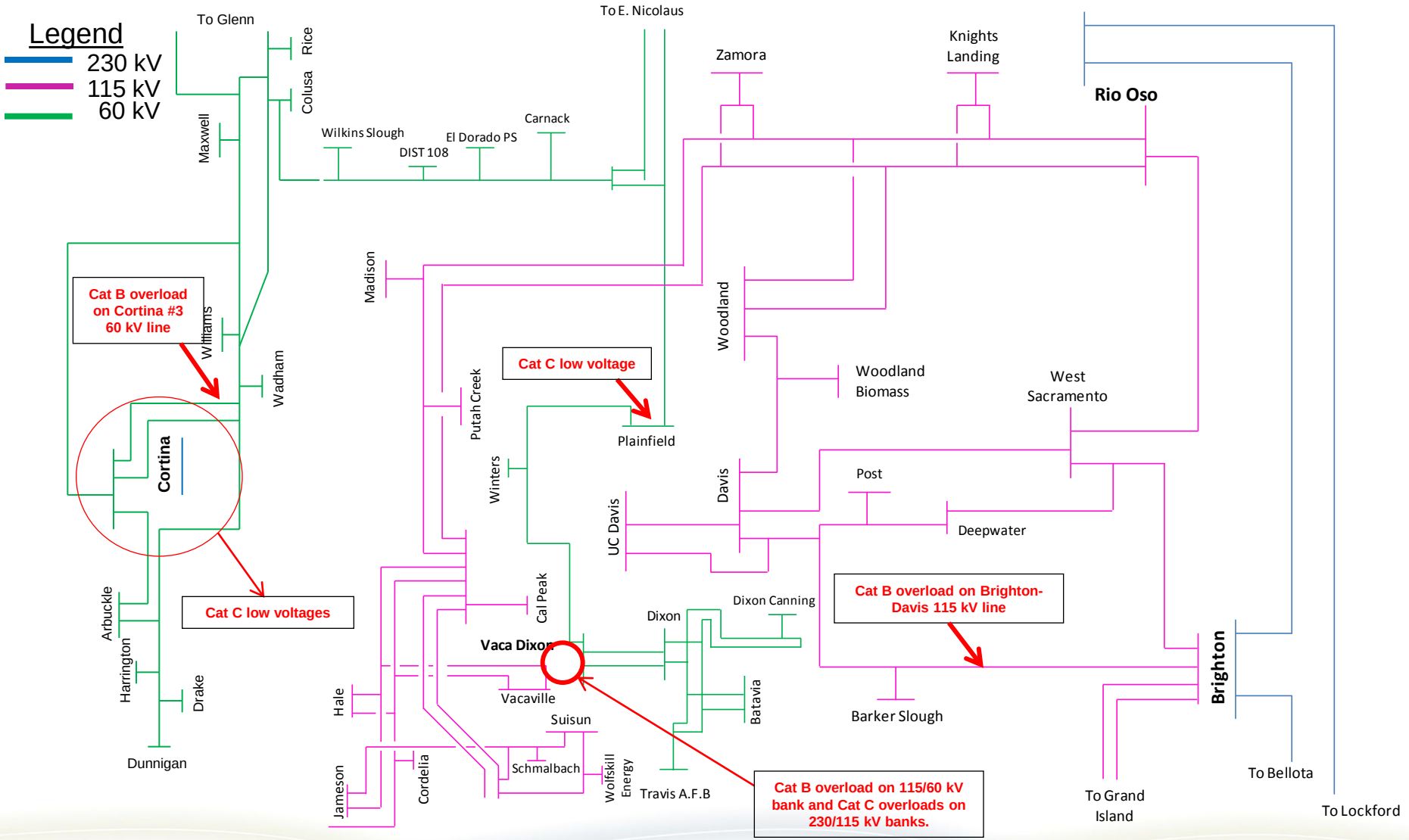
Sacramento Area – Results (Category A & B)

- Low Voltage
  - Plainfield 60 kV (Cat C / 2016)
    - Potential Mitigation – transferring load to adjacent Distribution Planning Areas and may need additional reactive support
  - Colusa 60 kV (Cat C / 2024)
    - Potential Mitigation – may need additional reactive support

- Voltage Deviation
  - Rice 60kV (Cat B / 2019)
    - Potential Mitigation – may need additional reactive support

Category C problems will be discussed in the area diagram in next slide

Sacramento Area – Results (cont'd)



Mitigation SPS, Load Switch, Load Drop, Reconductor

Sierra Area Assessment Summary

- The assessment identifies:
  - Thermal overloads due to Category B - 4 and Category C - 19
  - Low voltages due to Category B - 5 and Category C – 6 (area-wide: Placer 115/60 & Atlantic 115/60)
  - Voltage deviations due to Category B and Category C (area-wide: Placer 115/60 & Atlantic 115/60)
  - Two Category C contingencies resulted in divergence
- Comparing to last year results:
  - 1 new Category B thermal overload (after 2019)
  - Additional Spring Peak Scenario is studied in this year

Sierra Area – Results (Category A & B)

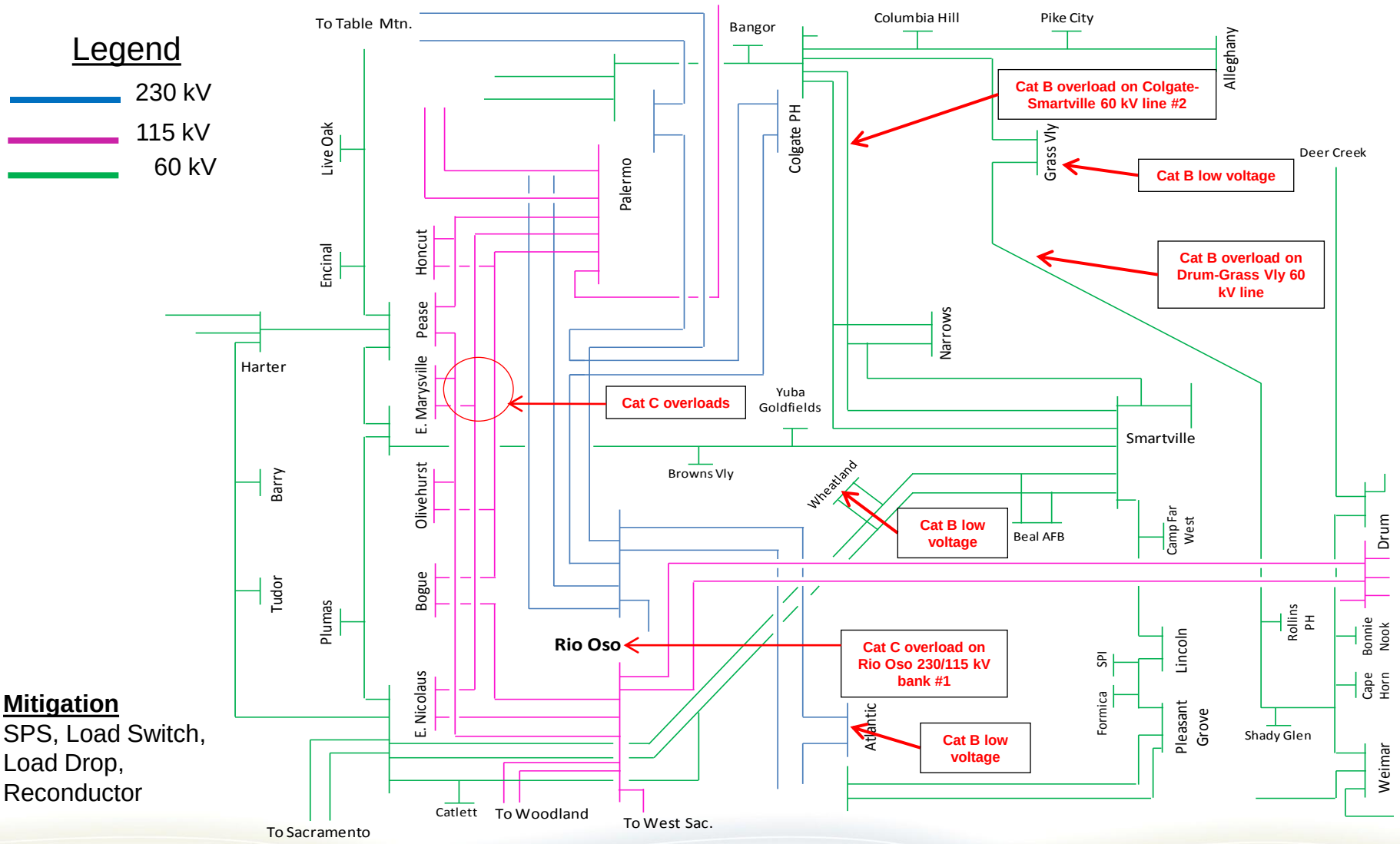
- Thermal Overloads
  - Placer 115/60 kV Bank (Cat B / 2024)
    - Potential Mitigation – may need additional Placer 115/60 kV Bank
  - Drum-Higgins 115 kV Line (Cat B / 2016)
    - Potential Mitigation – reduce Drum generation and may reconductor Drum-Higgins 115 kV Line
  - Colgate - Smartville 60 kV Line #2 (Cat B / 2016)
    - Potential Mitigation – Transfer Wheatland to alternate source and may need to reconductor Colgate - Smartville 60 kV Line #2
  - Drum-Grass Valley-Weimer 60 kV line (Cat B / 2016)
    - Potential Mitigation – Distribution load transfer / disable automatics and may need to reconductor Drum-Grass Valley-Weimer 60 kV line

Sierra Area – Results (Category A & B) (cont'd)

- Low Voltage
  - Atlantic Area 60 kV (Cat B / 2016)
    - Potential Mitigation – Adjust tap settings on the Atlantic 230/60 kV Transformer and may add additional reactive support
  - Wheatland 60 kV (Cat B / 2016)
    - Potential Mitigation – Transfer Wheatland to alternate source and may add additional reactive support
  - Higgins 115 kV (Cat B / 2016)
    - Potential Mitigation – Distribution load transfer / disable automatics and may add additional reactive support
  - Grass Valley Area 60 kV (Cat B / 2024)
    - Potential Mitigation – Distribution load transfer / disable automatics and may add additional reactive support
- Voltage Deviation
  - Same as above

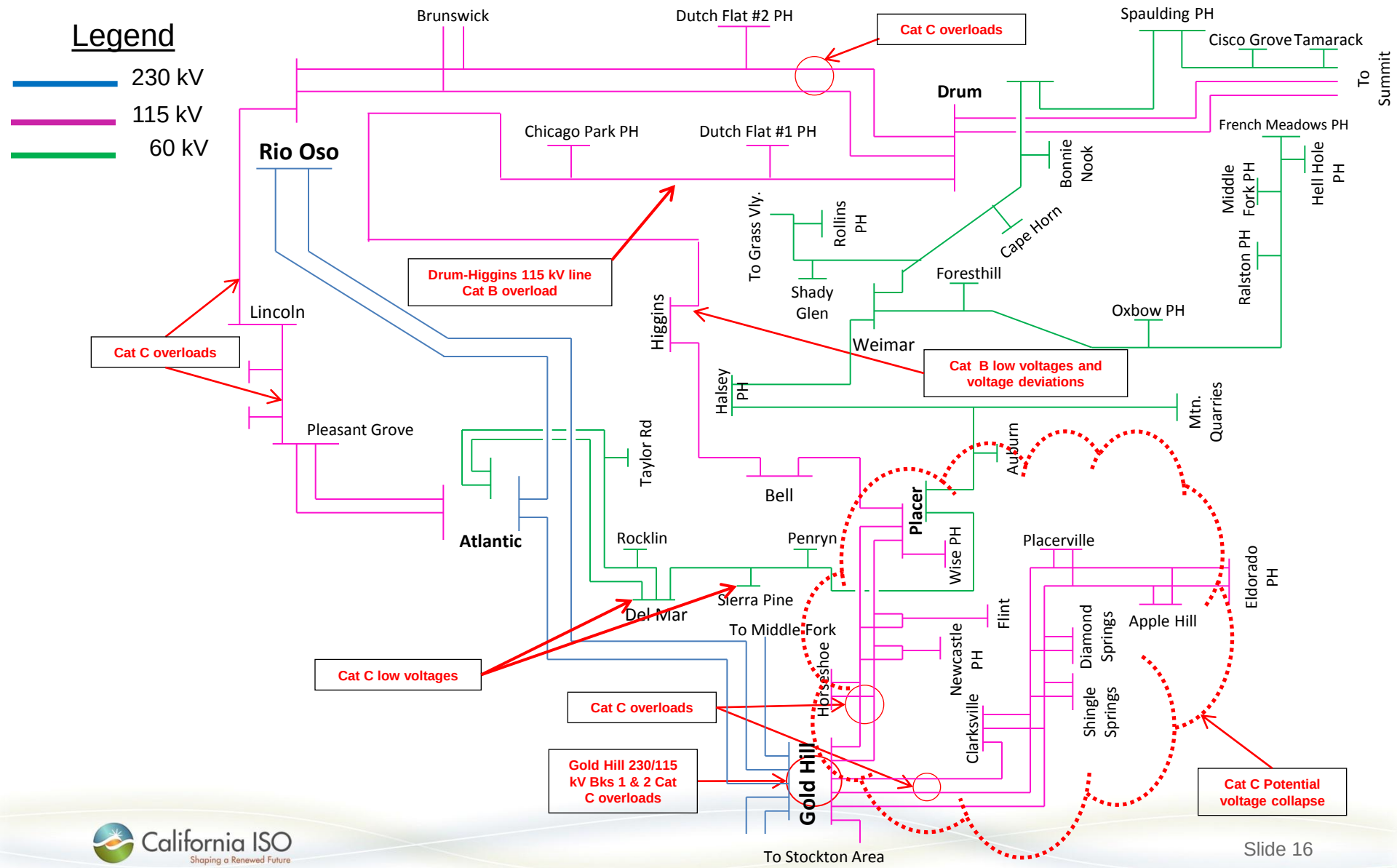
Category C problems will be discussed in the area diagram in next slide

Sierra Area – Results (cont'd)



Mitigation
SPS, Load Switch, Load Drop, Reconductor

Sierra Area – Results (cont'd)



Stockton/Stanislaus Area Assessment Summary

- The assessment identifies:
  - Thermal overload due to Category B - 3 and Category C - 26
  - Low voltages due to Category C – 1 (area-wide: Lodi 60 kV)
  - Voltage deviations due to Category B - 2
  - Area-wide high voltage under normal condition (off-peak)
- Comparing to last year results:
  - 1 new Category B thermal overload
  - Additional Spring Peak Scenario is studied in this year

Stockton/Stanislaus Area – Results (Category A & B)

- Thermal Overloads
  - Valley Springs No. 1 60 kV Line (Cat B / 2016)
    - Potential Mitigation – Disable automatics at Linden and may need to Reconductor Valley Springs No. 1 60 kV Line
  - Lockeford No. 1 60 kV Line (Cat B / 2016)
    - Potential Mitigation – Disable automatics during peak loading conditions
  - Stockton A – Weber No. 1 60 kV Line (Cat B / 2016)
    - Potential Mitigation – Distribution load transfer and/or disable automatics

Category C problems will be discussed in the area diagram

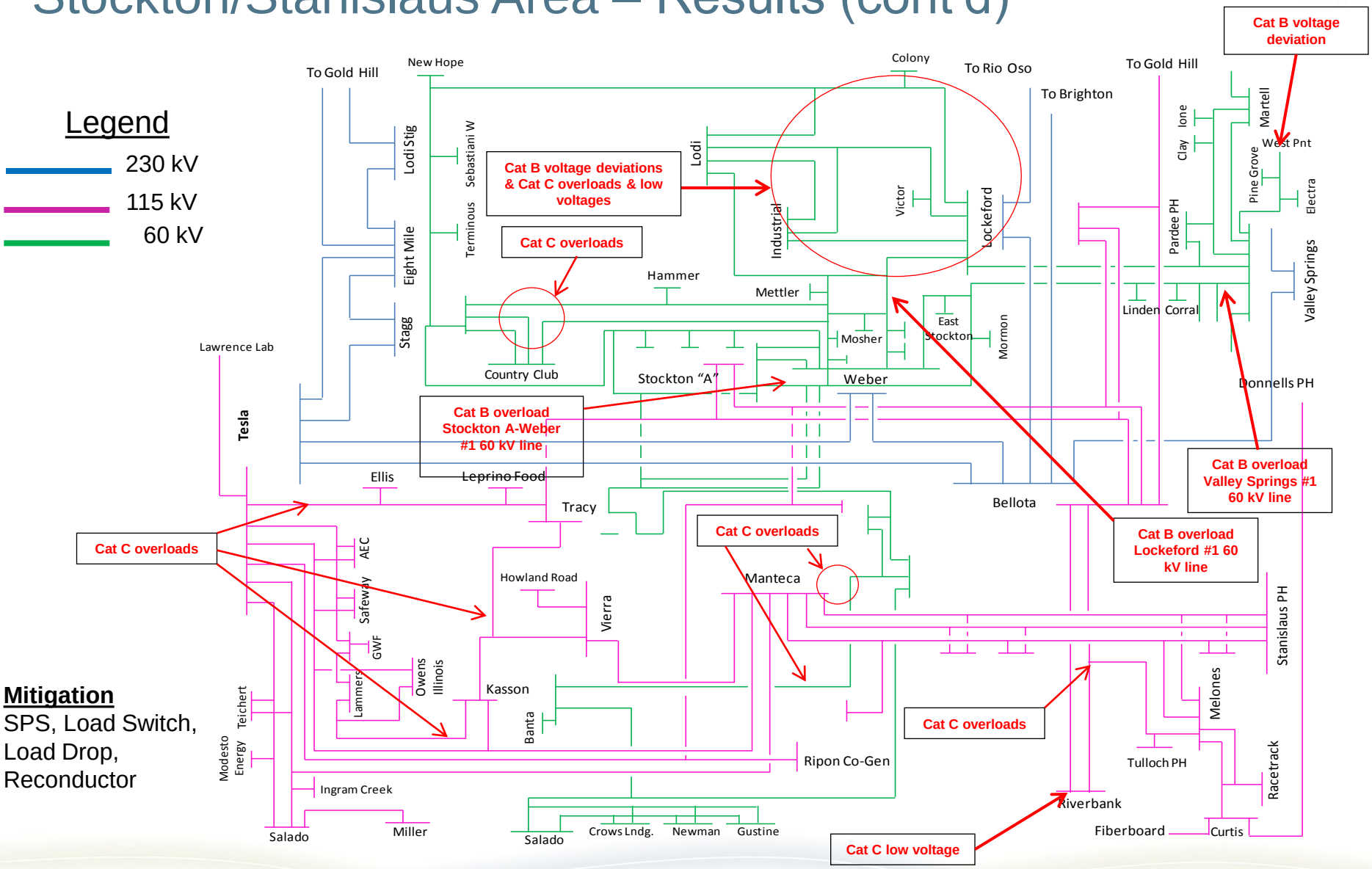
Stockton/Stanislaus Area – Results (Category A & B)

- Low Voltage
  - Westley 60 kV (Cat B / 2016)
    - Potential Mitigation – Disable automatics during peak loading conditions and may need additional reactive support
  - Lockford 230 kV (Cat B / 2016)
    - Potential Mitigation – Disable automatics during peak loading conditions and may need additional reactive support

- Voltage Deviation
  - MSHR 60V (Cat B / 2016)
    - Potential Mitigation – Disable automatics during peak loading conditions and may need additional reactive support
  - Linden 60 kV (Cat B / 2016)
    - Potential Mitigation – Adjust West Point gen terminal voltage

Category C problems will be discussed in the area diagram in next slide

Stockton/Stanislaus Area – Results (cont'd)



Mitigation
SPS, Load Switch, Load Drop, Reconductor

Greater Bay Area
Preliminary Reliability Assessment Results

Abhishek Singh
Sr. Regional Transmission Engineer
Binaya Shrestha
Sr. Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Greater Bay Area

- Service areas cover Alameda, Contra Costa, Santa Clara, San Mateo and San Francisco counties
- For ease of conducting the performance evaluation, the Greater Bay Area is divided into Seven sub-areas:
  - San Francisco
  - San Jose
  - Peninsula
  - Mission
  - East Bay
  - Diablo
  - De Anza

Greater Bay Area

- Major substations: Vaca Dixon, Tesla and Metcalf
- Supply sources: Vaca Dixon, Tesla and Metcalf
- Generation: Over 7,000 MW of generation capacity.
- Comprised of 60, 115 & 230 & 500 kV transmission facilities.
- Summer Peak 8,841 MW in 2024 (482 MW of AAEE)

Greater Bay Area Assessment Summary

- The 2014-15 assessment identified:
  - Thermal overloads due to Category B – 9 and Category C - 78
  - Low voltages due to Category B – 2 and Category C – 7
  - Voltage deviations due to Category B – 15
  - Area-wide high voltage under normal condition (off-peak)
- Compared to last year results:
  - 1 new Category B thermal overload
  - Numerous New Category C3 issues.
  - Last year there was 1 project approved in this area
    - Morgan Hill Area Reinforcement

Greater Bay Area – Results (Category A & B)

- Thermal Overloads (Category B)
  1. Cooley Landing-Los Altos 60kV Line (Cat B / 2016)
  2. Cooley Landing-Stanford 60kV Line (Cat B / 2016)
  3. Jefferson-Stanford #1 60kV Line (Cat B / 2016)
  4. Monta Vista-Los Gatos 60kV Line (Cat B / 2016)
  5. Millbrae-Sneath Lane 60kV Line (Winter Peak-Cat B / 2019-2024)
  6. Newark-Dixon Landing 115kV Line (Cat B / 2016)
  7. Oleum-Christie 115kV Line (Cat B / 2016-19)
  8. Potrero-Larkin #2 (AY-2) 115kV Cable (Winter Peak- Cat B / 2016-19-24)
  9. Potrero-Mission (AX) 115kV Cable (Winter Peak- Cat B / 2016-19-24)
- Potential Mitigations
  - Interim action plans for overloads with long-term projects in place.
  - Explore the option of modifying TBC DC Runback Scheme (#8 & #9).
  - # 5 overload is under review for possible modification of automatic load restoration scheme at Half Moon bay substation.

Category C problems will be discussed in the area diagram

Greater Bay Area – Results (Category A & B)

- Voltage Results
  - Contra Costa area high voltage (Cat A / 2016)
  - Almaden 60 kV low voltage (Cat B / 2016)
- Potential Mitigations
  - Change Contra Costa 230/115 kV transformer tap setting
  - Almaden Shunt Capacitor Project (Approved Project)

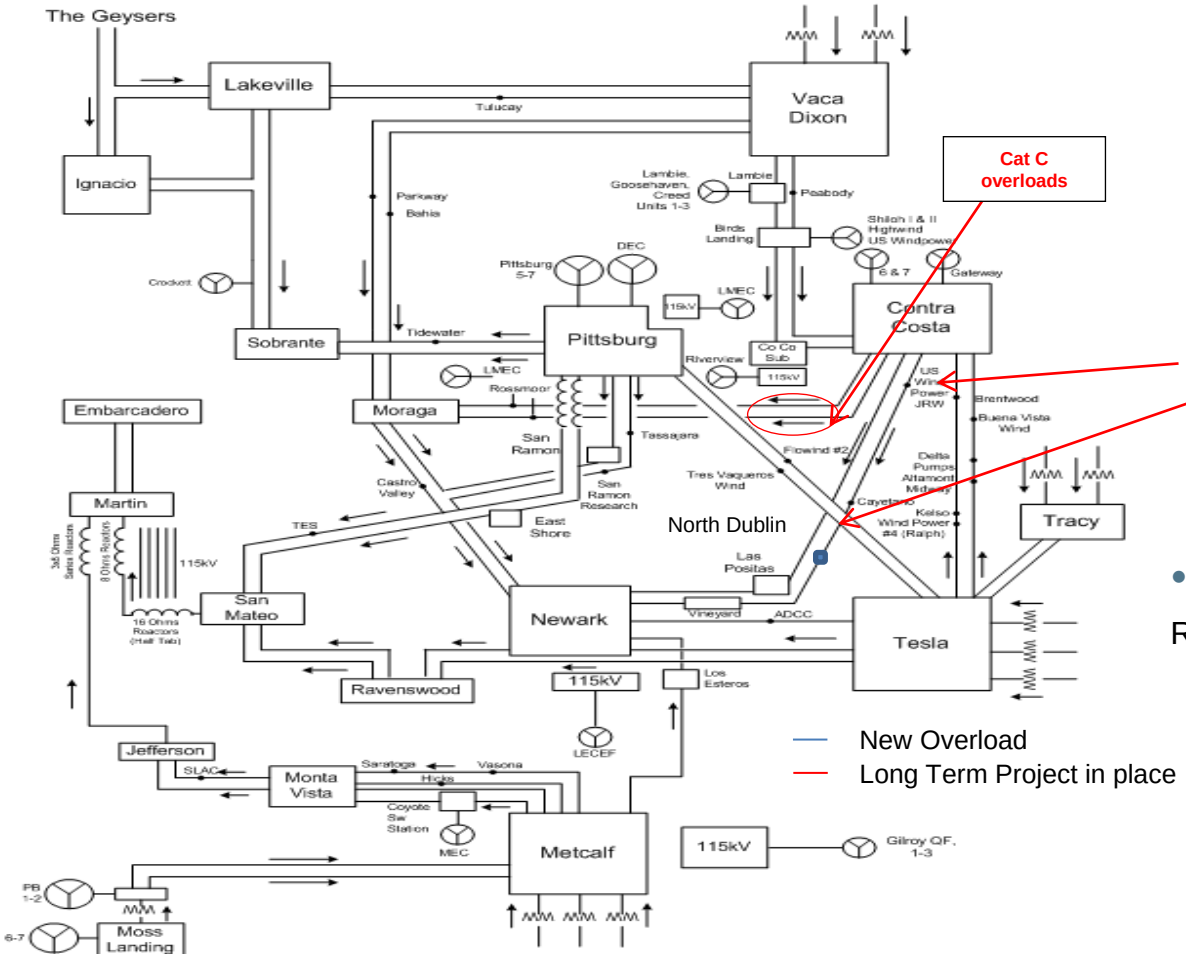
Category C problems will be discussed in the area diagram

Greater Bay Area – Results (Category A & B)

- Voltage Deviations
  - Edes 115 kV (Cat B / 2016)
  - Willow Pass 60 kV (Cat B / 2016-2019)
  - Half Moon Bay 60 kV (Cat B / 2016-2019-2024)
  - Los Gatos 60 kV (Cat B / 2016-19-24)
  - Dixon Landing 115 kV (Cat B / 2016)
  - Piercy 115 kV (Cat B / 2016)
  - Almaden 60 kV (Cat B / 2016-19-24)
  - Pacifica 60 kV (Cat B / 2016)
  - Sneath Lane 60 kV (Cat B / 2019-24)
  - San Bruno 60 kV (Cat B / 2019)
  - San Andreas 60 kV (Cat B / 2016)
  - Millbrae 60 kV (Cat B / 2016)
  - Los Altos 60 kV (Cat B / 2016)
  - Loyola 60 kV (Cat B / 2016)
- Potential Mitigations
  - Check automatic load flip flop schemes
  - Evergreen-Mabury Voltage Conversion
  - Almaden Shunt Capacitor Project
  - Change Martin transformer tap settings

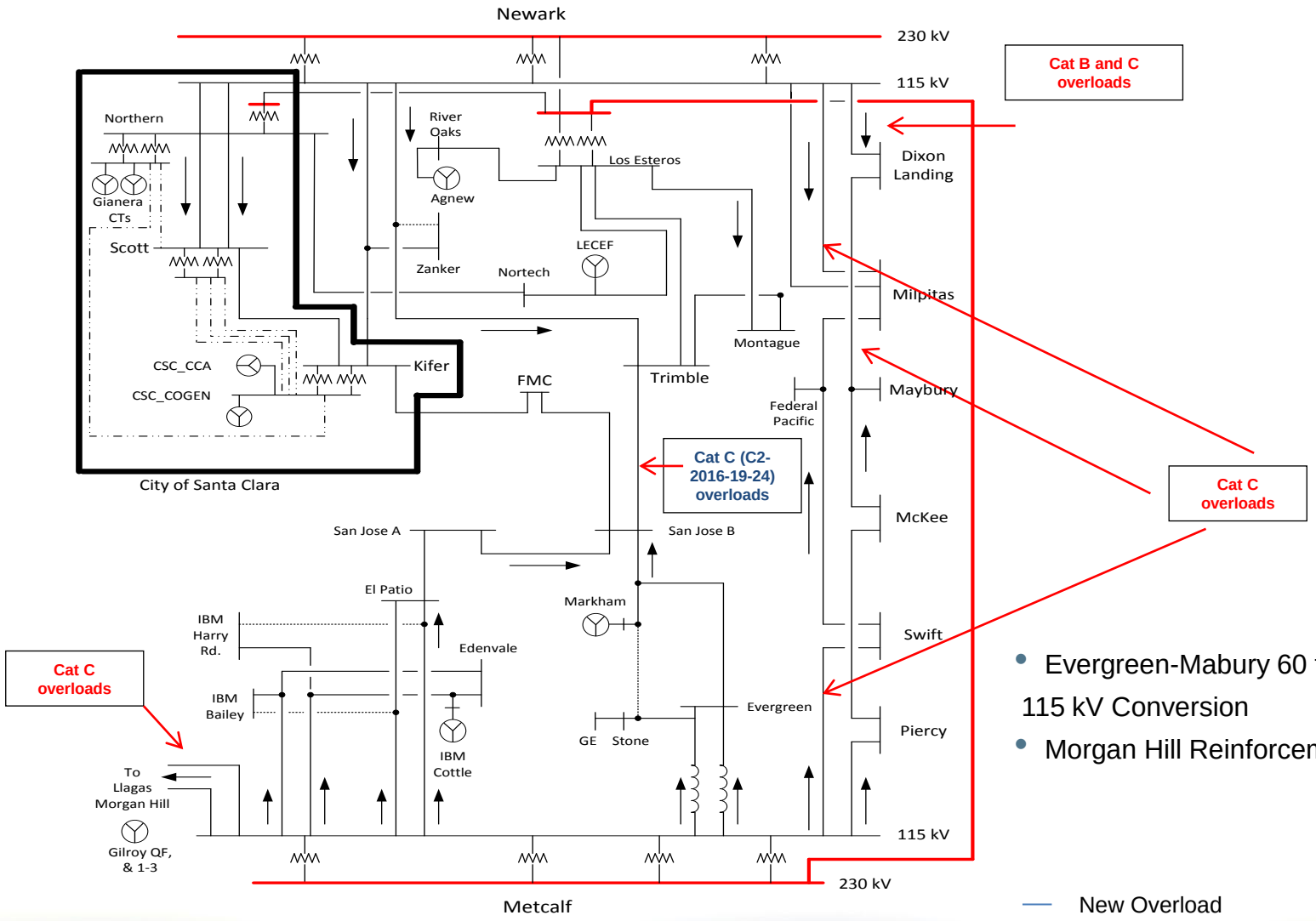
Category C problems will be discussed in the area diagram in next slide

Bay Area-230 kV issues



- Contra Costa - Moraga 230 kV Line Reconductoring (Approved Project)

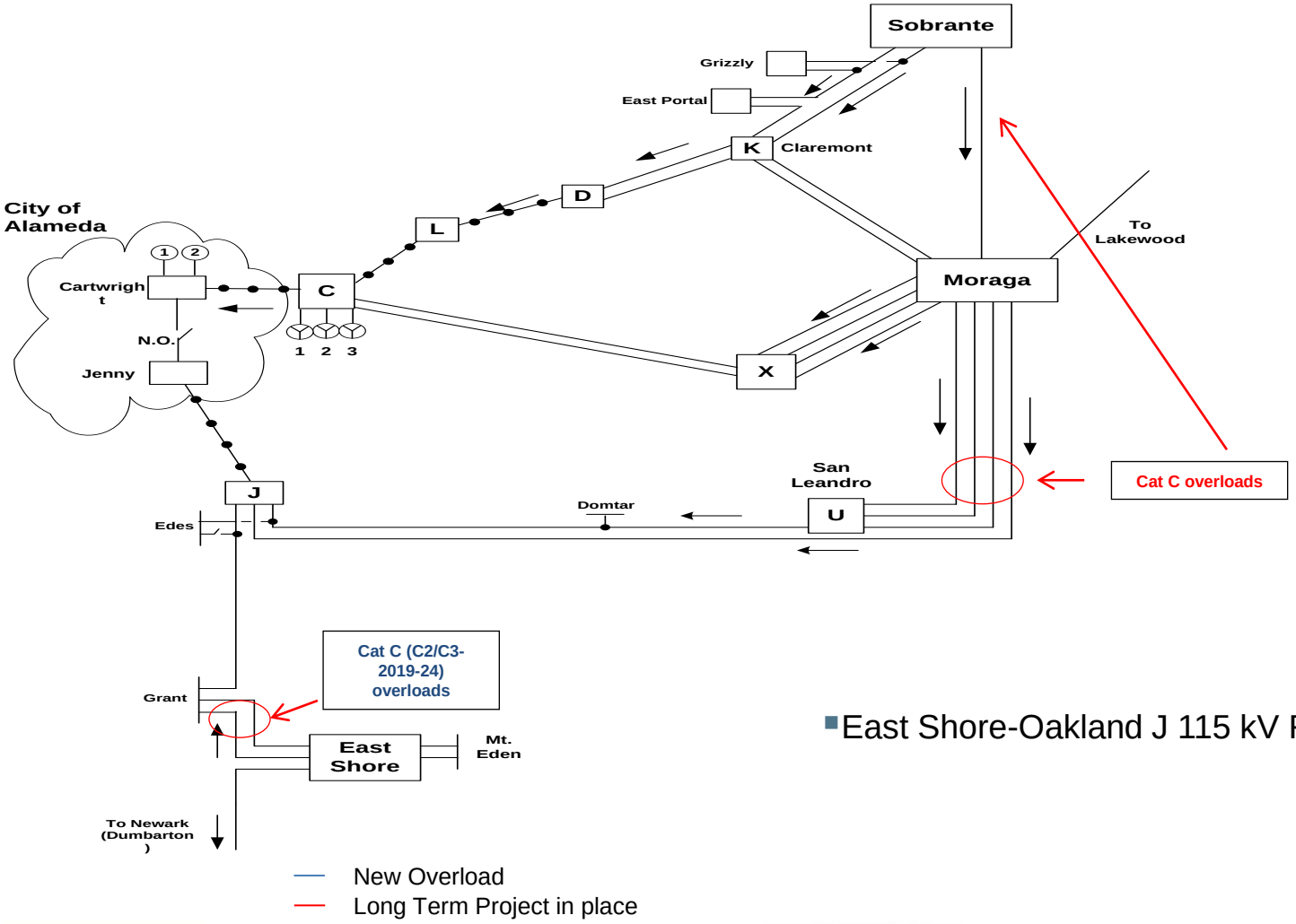
Greater Bay Area – Results (San Jose 115 kV system)



- Evergreen-Mabury 60 to 115 kV Conversion
- Morgan Hill Reinforcement Project

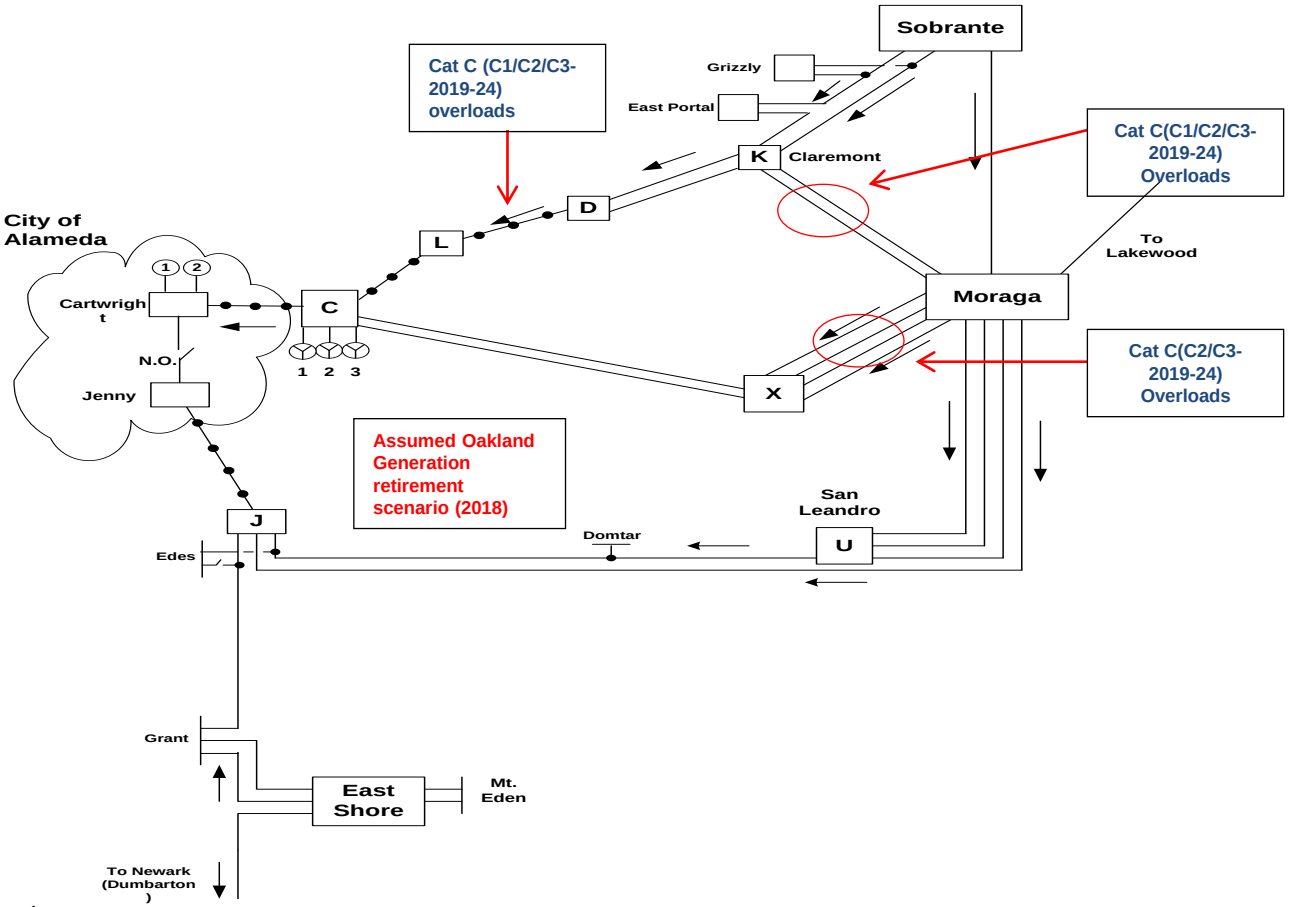
New Overload
Long Term Project in place

Greater Bay Area – Results (Oakland 115 kV system)



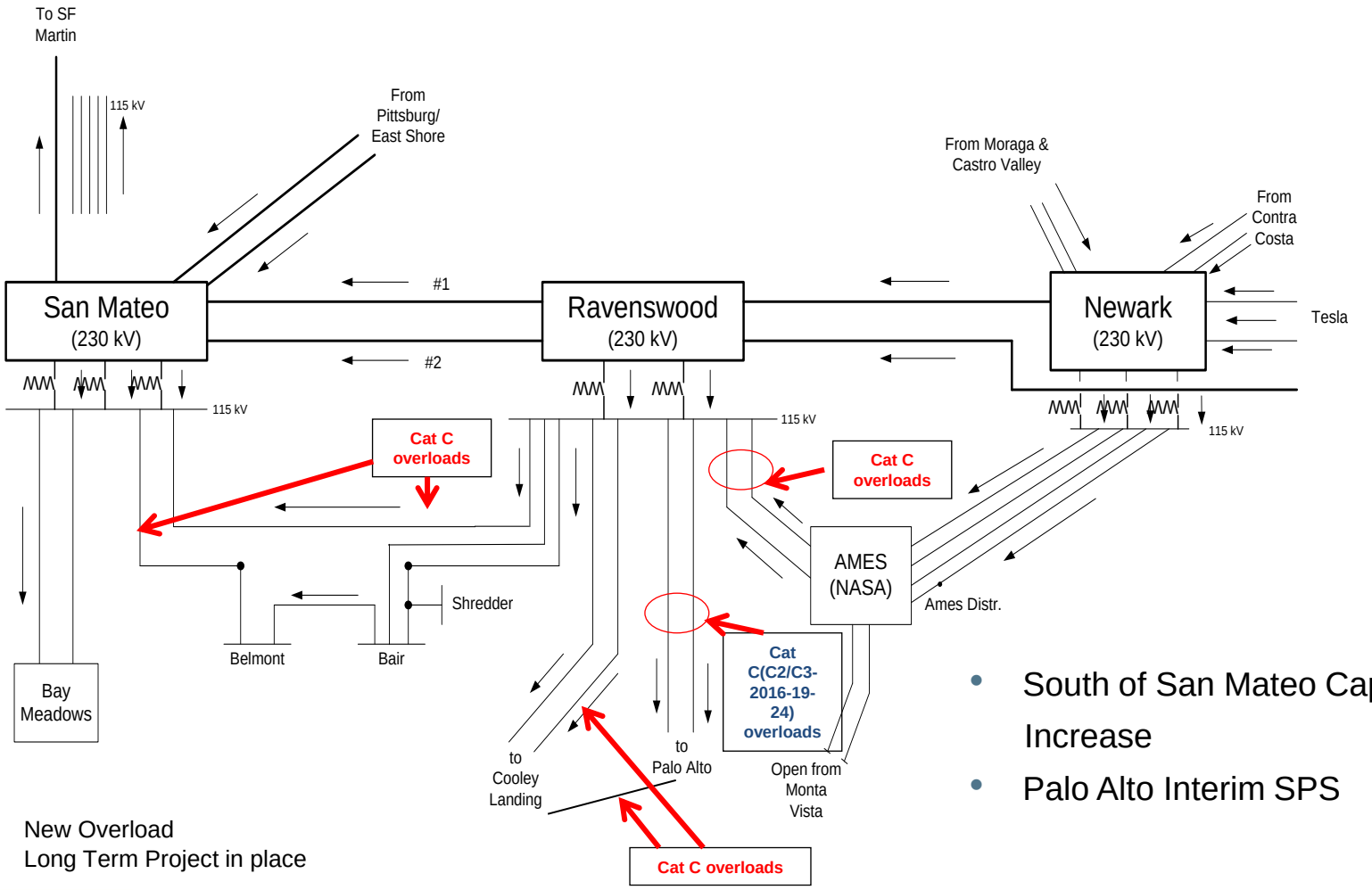
- East Shore-Oakland J 115 kV Reconductoring

Greater Bay Area – Results (Oakland generation issues)



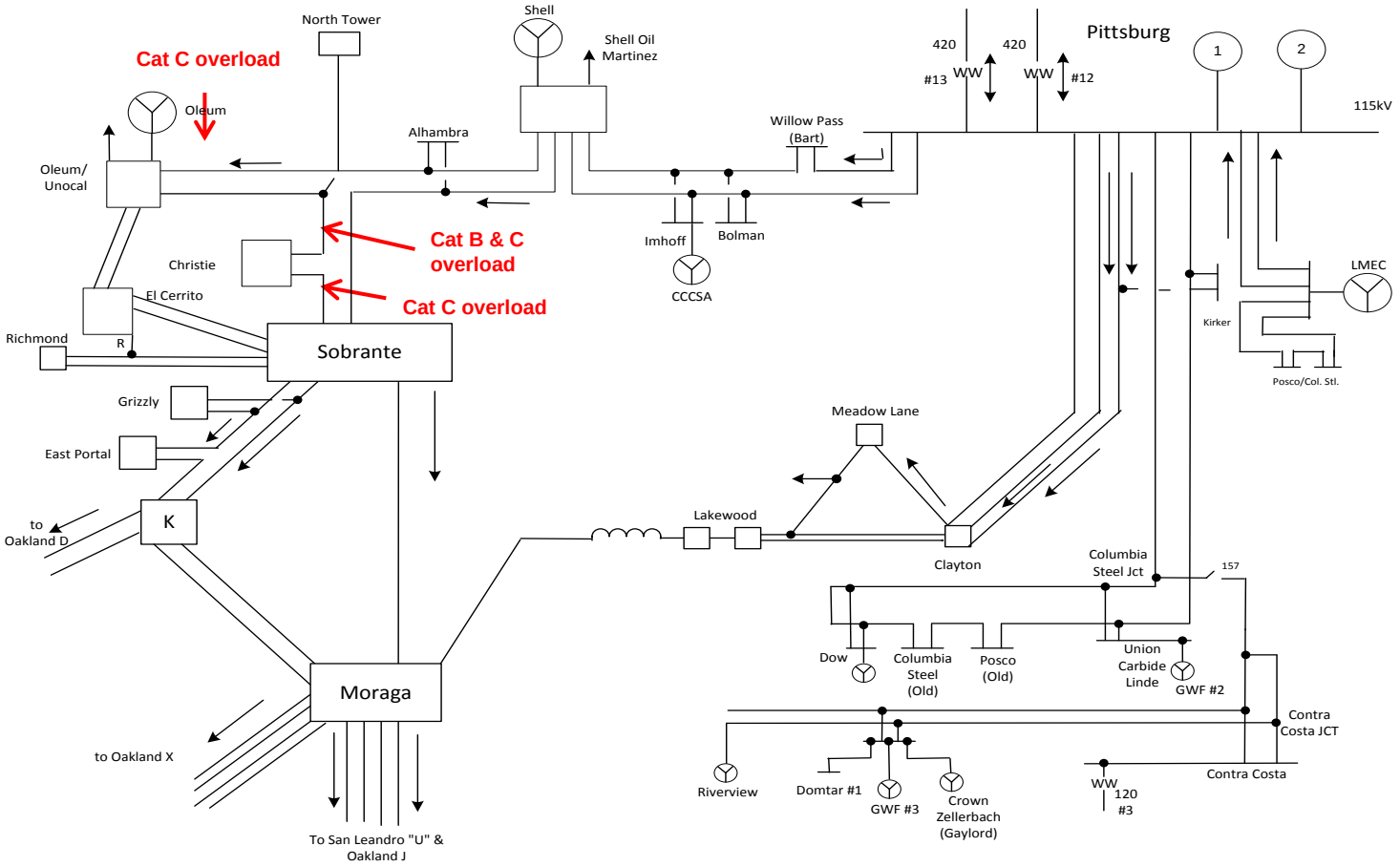
New Overload
Long Term Project in place

Greater Bay Area – Results (Peninsula 115 kV system)



- South of San Mateo Capacity Increase
- Palo Alto Interim SPS

Greater Bay Area – Results (North Tower 115 kV system)

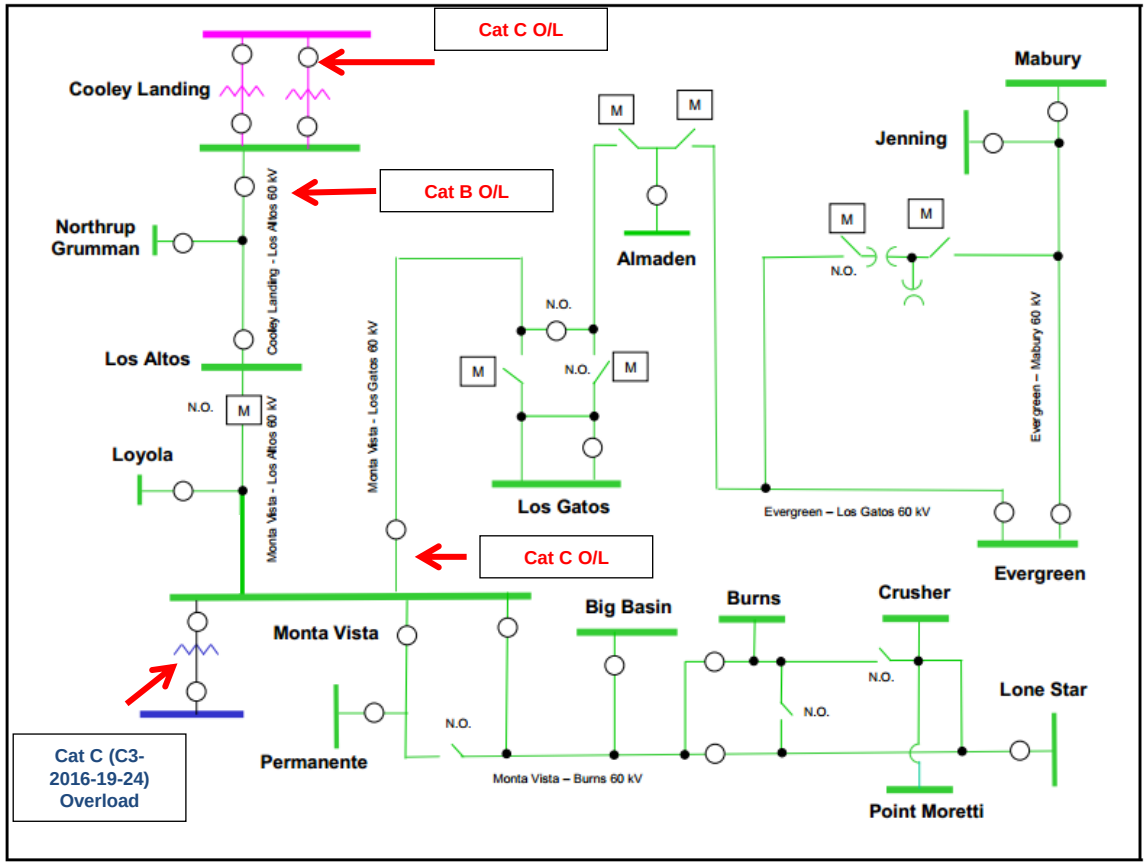


New Overload

Long Term Project in place

- North Tower 115 kV Looping Project
- Christie SPS

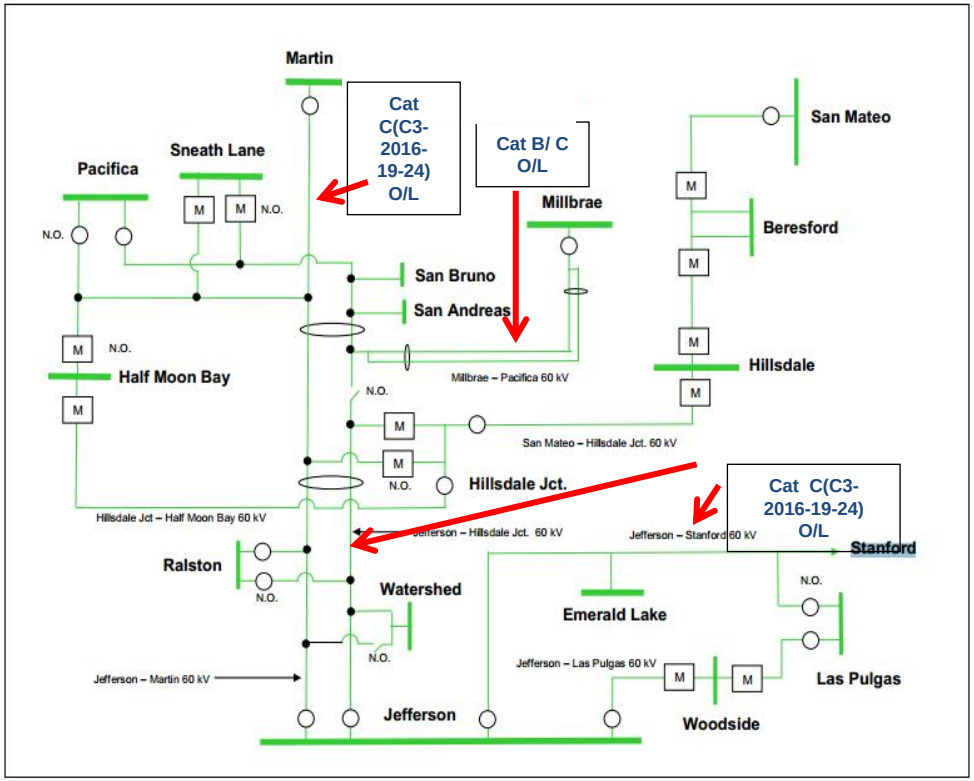
Greater Bay Area – Results (San Jose 60 kV system)



- Cooley Landing 115/60 kV Transformer Capacity Upgrade
- Cooley Landing - Los Altos 60 kV Line Reconductor
- Monta Vista - Los Gatos - Evergreen 60 kV Project

New Overload
Long Term Project in place

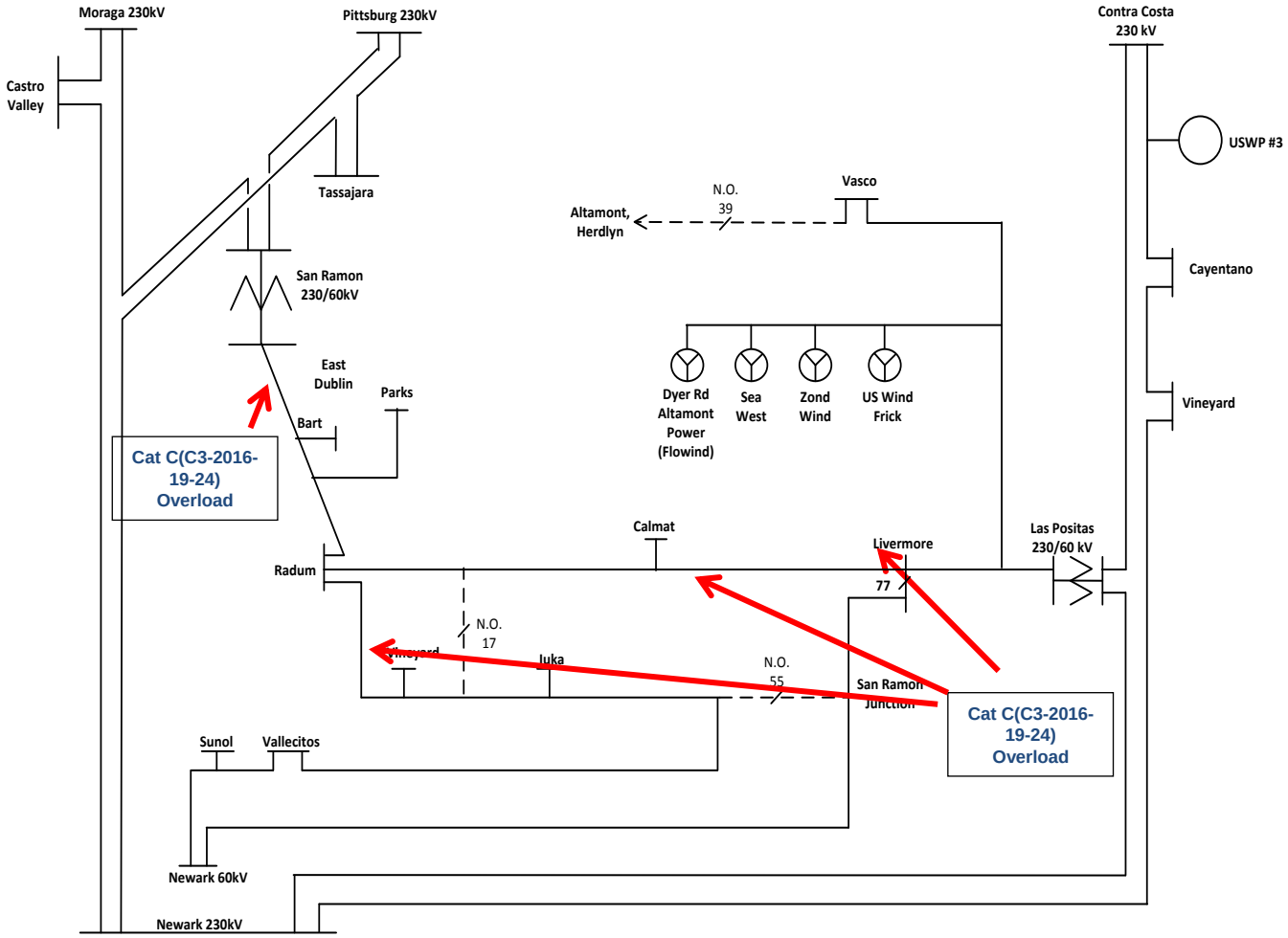
Greater Bay Area – Results (Peninsula 60 kV system)



- 1 new Category B issue
- Jefferson-Stanford #2 60 kV Line

New Overload
Long Term Project in place

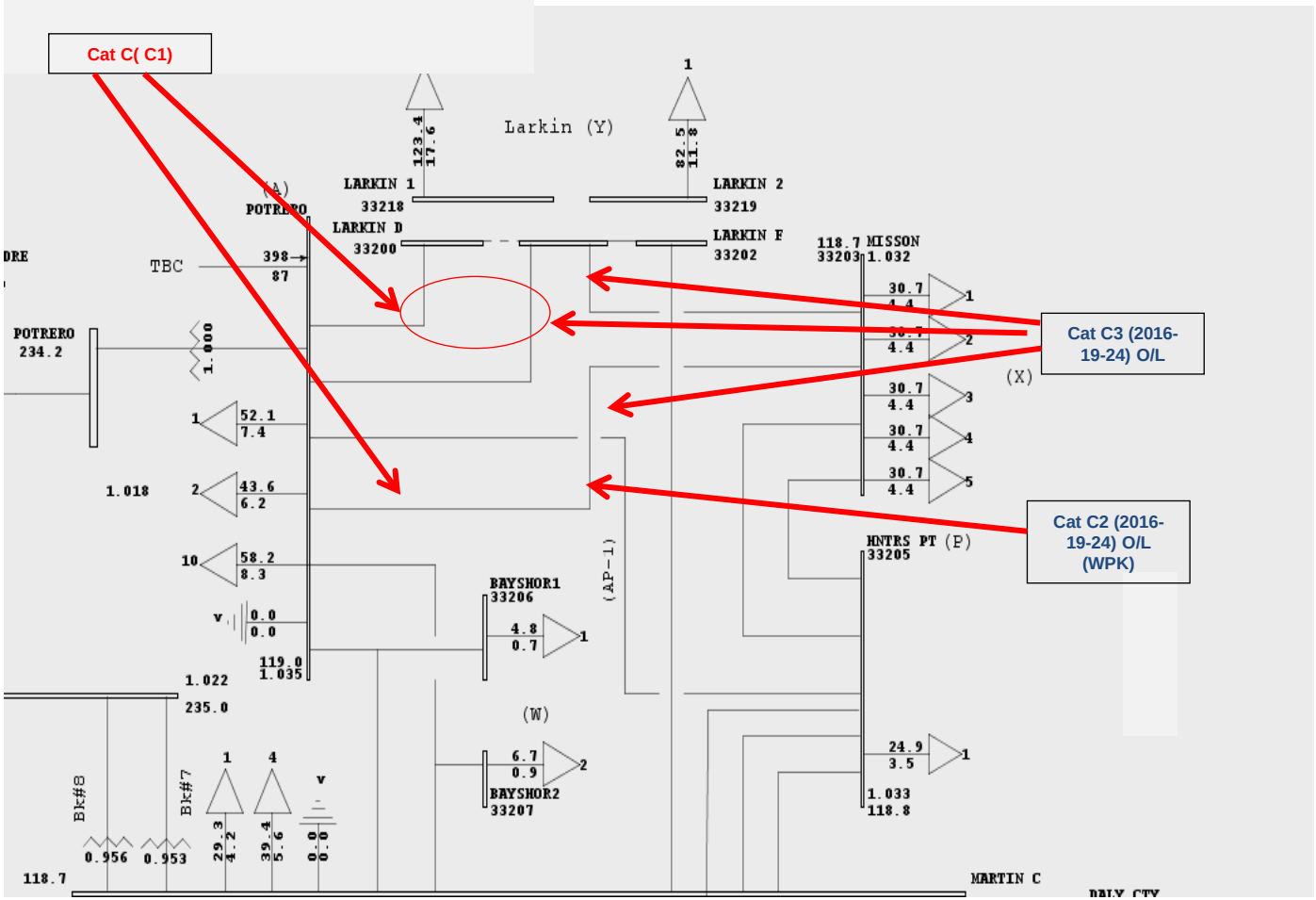
Greater Bay Area – Results (East Bay 60 kV system)



New Overload

Long Term Project in place

Greater Bay Area-North of Martin 115 kV system



- Potrero Bus Upgrade

California ISO
Shaping a Renewed Future

Fresno Area
Preliminary Reliability Assessment Results

Joseph E Meier, P.E.
Senior Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Greater Fresno Area

- Includes the San Joaquin Division
- Generation: Over 4,923 MW of generation in 2024 case
- Comprised of 60, 115, 230 & 500 kV transmission facilities.
- Summer Peak 3,869 MW in 2024

Fresno Area Assessment Summary

- The assessment identified:
  - Thermal overloads due to Category A – 2, Category B - 10 and Category C - 108
  - Low voltages due to Category B - 3 and Category C - 16
  - Voltage deviations due to Category B - 10 and Category C - 19
- Compared to last year results:
  - One new Category A overload
    - No PG&E project submitted
  - No Category B 230kV line overloads and one Category B 115kV overload
  - Los Banos 70kV area voltage/overload issues
    - Permanent “Summer Setup” may mitigate
  - Coalinga 70kV area has issues with T-1-1 in area
    - Permanent “Summer Setup” may mitigate

Fresno Area – Results (Category A & B)

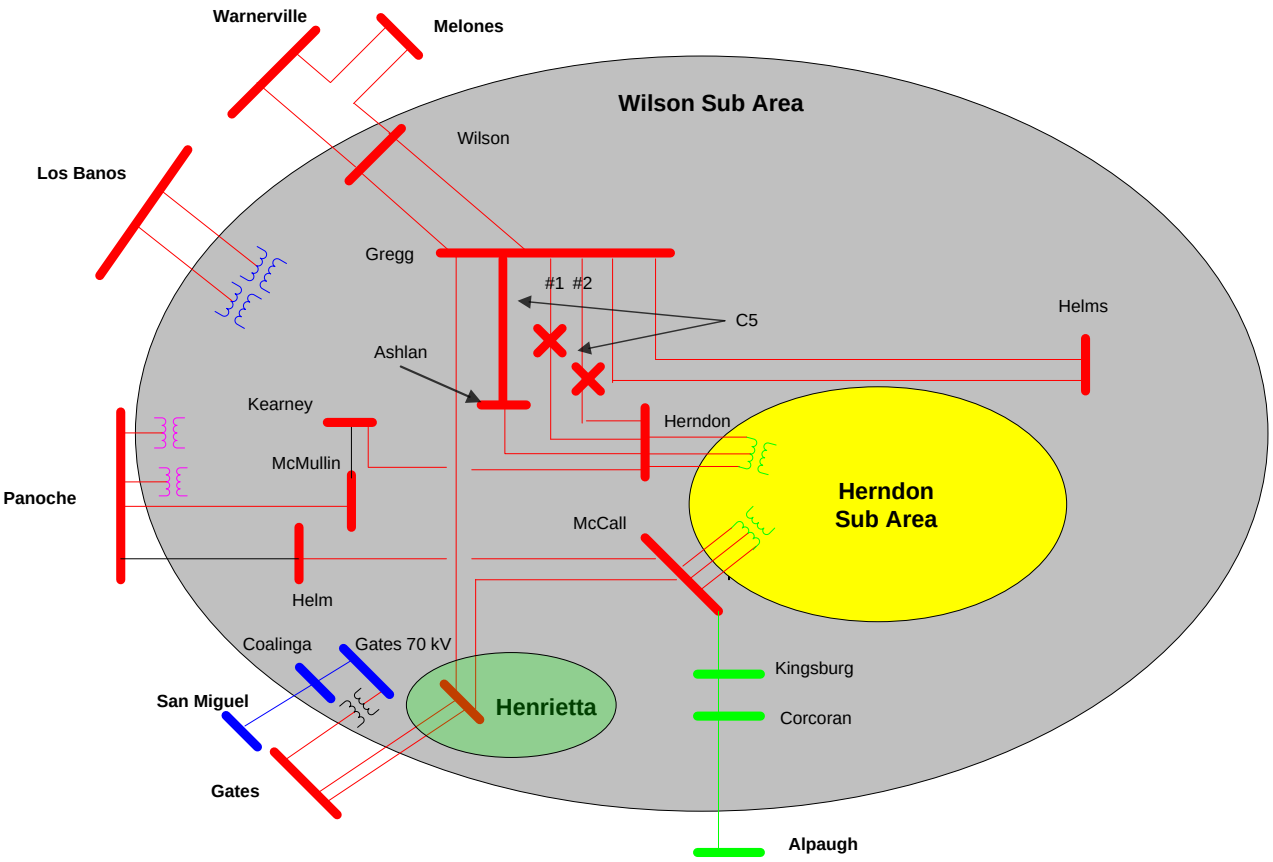
- Thermal Overloads (Category A)
  - Biola-Glass-Madera 70kV (Trigo Jct-El Peco Tap Section) (2024 Peak)
  - Kearney-Caruthers (70kV) (2016 Peak)
- Thermal Overloads (Category B)
  - Borden #1 115/70kV (2024 Peak)
  - Oro Loma #2 115/70kV (2016 Peak)
  - Los Banos-Livingston Jct-Canal 70kV (Los Banos-Chevron Pipeline Section) (2016 Peak)
  - Los Banos-Livingston Jct-Canal 70kV (Santa Nella-Livingston Jct Section) (2016 Peak)
  - Coalinga 1-Coalinga 2 70kV (Coalinga 1-Tornado Tap Section) (2016 Peak)
  - Panoche-Oro Loma 115kV (Panoche-Hammonds Section) (2019 & 2024 Peak)
  - Reedley-Orosi 70kV (2016 Peak)
  - Reedley-Dinuba 70kV (2016 Peak)

Fresno Area – Results (Category A & B)

- Low Voltage (Category B)
  - Chowchilla 115kV Area (2019 & 2024 Peak)
  - Mendota 115kV Area (2016 Peak)
- Voltage Deviation (Category B)
  - Borden 230kV (Borden 230kV Area) (2016 Peak)
  - Chowchilla 115kV (Chowchilla 115kV Area) (L-1 for All Peak, worse G-1/L-1 for 2019 & 2024 Peak)
  - Dairyland 115kV (Chowchilla 115kV Area) (L-1 for All Peak, worse G-1/L-1 for 2016 Peak)
  - Mendota 115kV (Mendota 115kV Area) (2016 Peak)
  - Angiola 70kV (Kingsburg Area) (All Peak)
  - Dinuba 70kV (Reedley 70kV Area) (2016 Peak)
  - Caruthers 70kV (Kearney 70kV Area) (2019 Peak) (Check xfmr tap settings)
  - Firebaugh 70kV (Oro Loma 70kV Area) (2016 Peak)

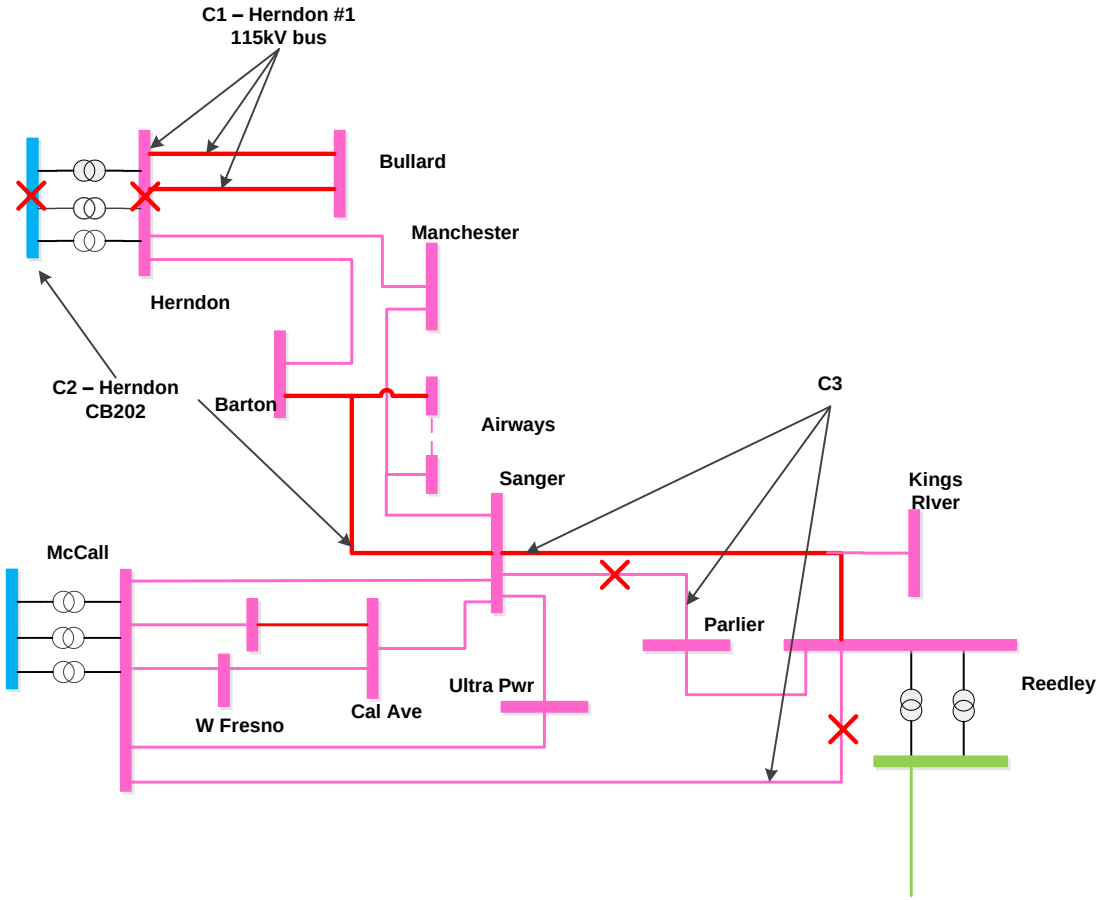
Fresno Area – Results

- Thermal Overloads
  - Gregg-Ashlan 230kV (16)
- Voltage Deviation
  - Borden 230kV Area (16)
- Potential Mitigation
  - Accelerate 2010 TPP Project
  - Approved Borden 230kV Voltage Support – Action Plan



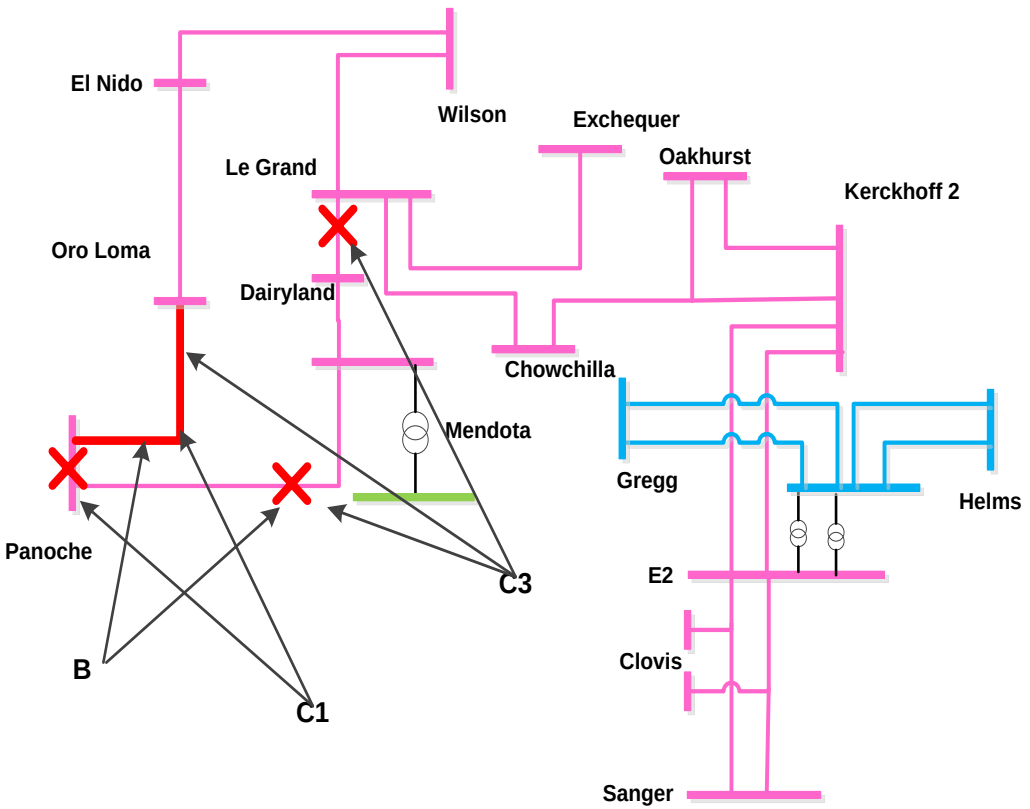
Fresno Area – Results

- Thermal Overloads
  - Kings River-Sanger-Reedley 115kV (16)
  - Herndon-Bullard #1 or #2 115kV (All)
  - Barton-Airways-Sanger 115kV (16)
- Voltage Deviation
  - None in this area
- Potential Mitigation
  - SPS to drop Bullard or Pinedale load for Herndon 115kV bus fault
  - 2-13-2014 TPP Approved North Fresno 115kV Reinforcement (ISD 2017) mitigates McCall CB202 or Herndon CB202 failure in later years – Action Plan.
  - 2013-2014 TPP Approved McCall-Reedley #2 115kV mitigates later years – Action Plan



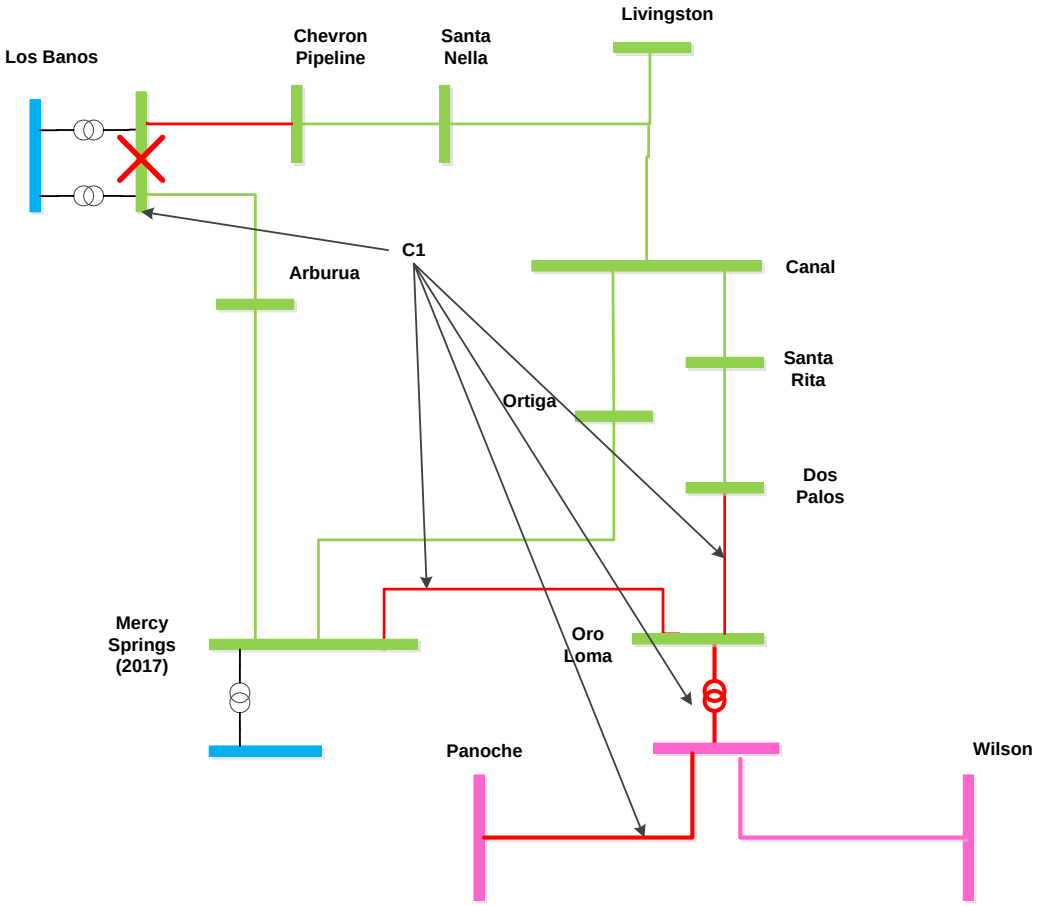
Fresno Area – Results

- Thermal Overloads
  - Panoche-Oro Loma 115kV (19 & 24)
- Voltage Deviation
  - Chowchilla 115kV Area (All)
  - Mendota 115kV Area (All)
- Potential Mitigation
  - Reconductor Panoche-Oro Loma 115kV with 477 SSAC
  - Add voltage support at Chowchilla 115kV Area
  - Loop Le Grand-Dairyland 115kV into Chowchilla 115kV
- Major Projects
  - New 230/115kV substation looping on Helms-Gregg #1 & #2 230kV lines (ISD 2017)



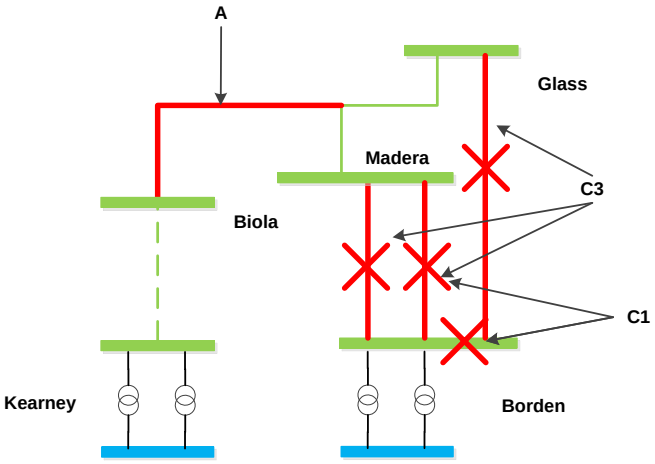
Fresno Area – Results

- Thermal Overloads
  - Oro Loma #2 115/70kV
  - Oro Loma-Canal #1 70kV
  - Los Banos-Canal-Oro Loma #1 70kV
  - Panoche-Oro Loma 115kV
  - Many caused by N-1-1 in this area
- Voltage Deviation
  - Los Banos 70kV Area (84% in 2016 Peak – collapse)
- Potential Mitigation
  - New Mercy Springs 230/70kV substation (ISD 2017) mitigates most contingencies – Action Plan until 2017
  - Permanent summer setup in Los Banos 70kV area



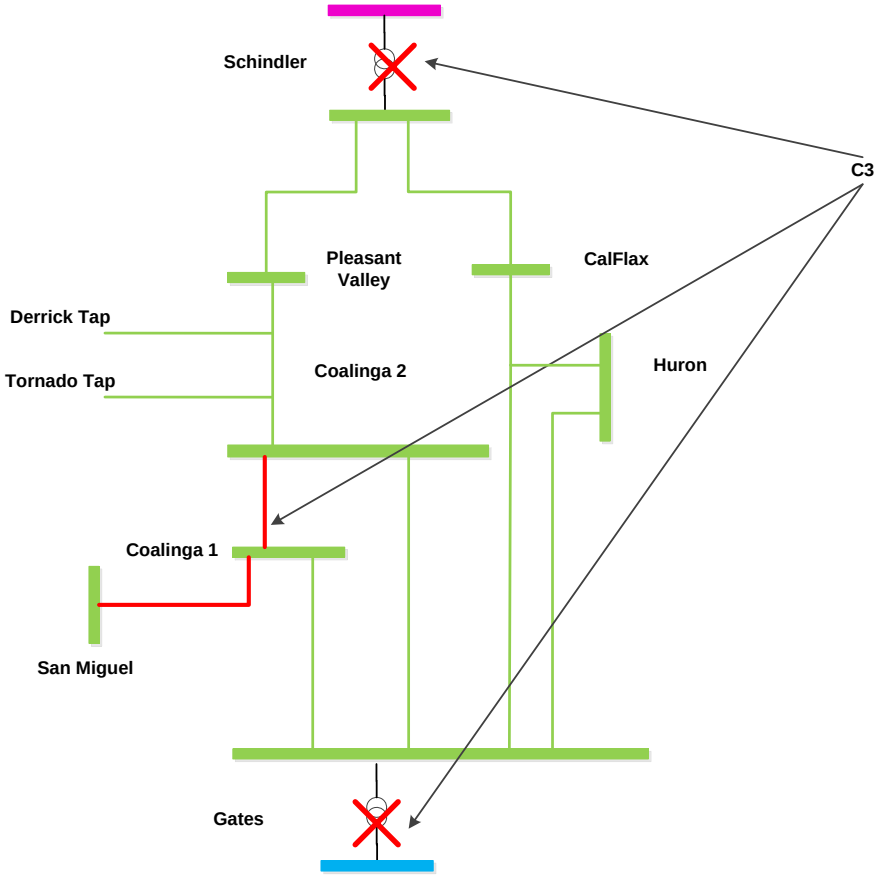
Fresno Area – Results

- Thermal Overloads
  - Borden #1 230/115kV (24)
  - Borden-Madera #2 70kV (All)
  - Biola-Glass-Madera 70kV
- Voltage Deviation
  - Borden 230kV (16)
- Potential Mitigation
  - Borden 230kV Voltage project mitigates deviation
  - Reconductor Borden-Madera #1 & #2 70kV
  - Reconductor Biola-Glass-Madera 70kV
  - Reconductor Borden-Glass 70kV
  - Transfer load to Kearney side



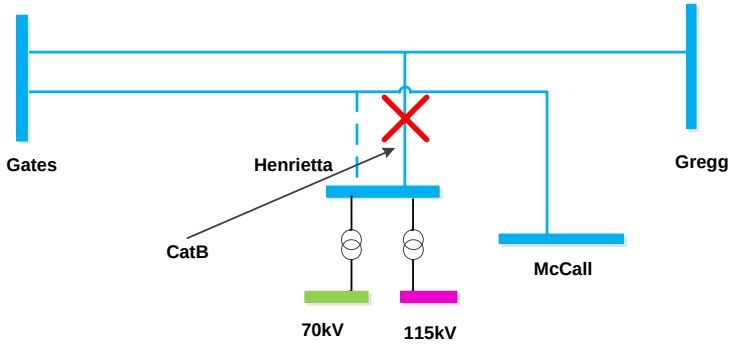
Fresno Area – Results

- Thermal Overloads
  - Coalinga 1-Coalinga 2 70kV
  - San Miguel-Coalinga 1 70kV
- Voltage Deviation
  - None in this area
- Potential Mitigation
  - SPS for loss of Gates #5 230/70kV, Schindler #1 115/70kV, or Schindler-Huron-Gates 70kV
  - Permanent summer setup – open San Miguel-Coalinga 1 70kV



Fresno Area – Results

- Thermal Overloads
  - Collapse in 2016 with no GWF
- Voltage Deviation
  - Collapse in 2016 with no GWF
- Load Drop
  - 115MW per Henrietta RAS document
  - For Cat B or Gates-Gregg 230kV, Henrietta RAS will operate before Gates-McCall 230kV tap closes in.
  - Weak 115kV supplying 70kV
  - NAS Lemoore on 70kV
- Potential Mitigation
  - BAAH at Henrietta 230kV
  - Eliminates load drop for Cat B contingency



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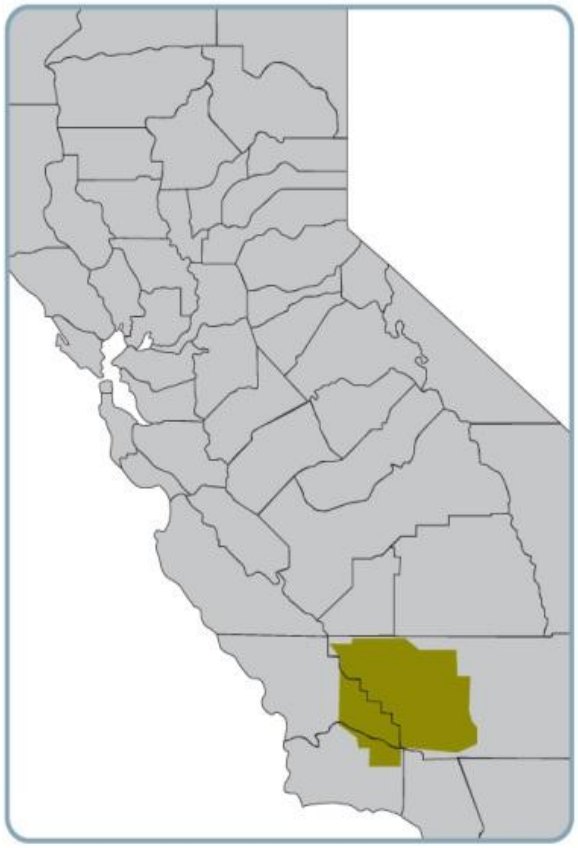
Kern Area – Central and Outlying Preliminary Reliability Assessment Results

Chris Mensah-Bonsu, Ph.D.
Senior Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Kern Area



- Located south of the Yosemite-Fresno area and includes southern portion of the PG&E San Joaquin Division
- Major stations include Midway and Kern Power Plant
- Generation: Over 3,500 MW of generation
- Transmission system includes 60, 115 and 230 kV facilities.
- 2024 Summer Peak: 2,100 MW

Kern Area Assessment Summary

- The assessment identified:
  - Thermal overloads due to Category B - 4 and Category C - 16
  - No new low voltage concerns due to Categories A, B or C
  - No new voltage deviations concerns due to Categories A, B or C
- Compared to last year results:
  - 4 new Category B thermal overloads
  - 16 new Category C thermal overloads

Kern Area – Results (Category A & B)

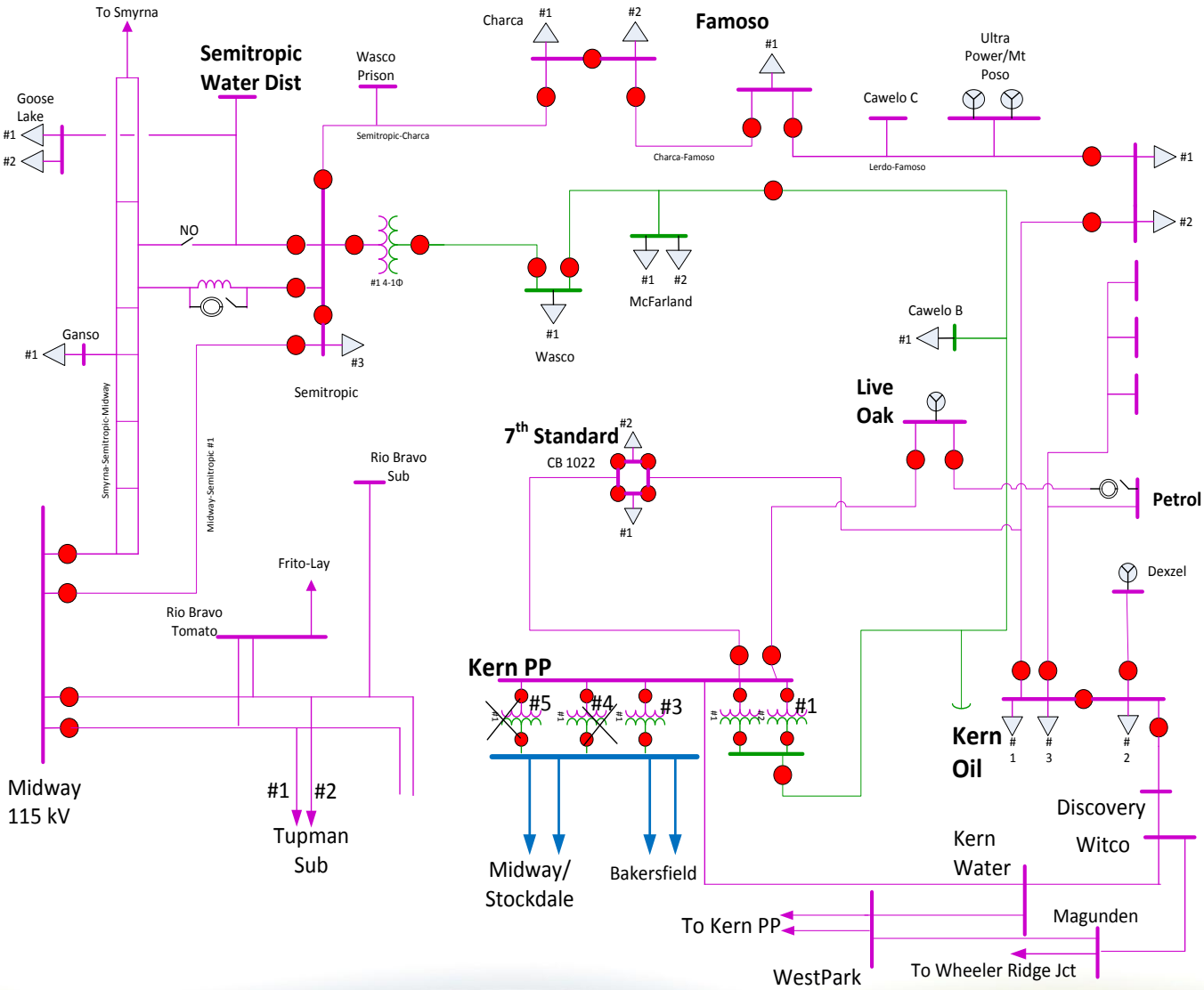
- Thermal Overloads
  - No thermal overloads due to Category A contingency conditions
  - 4 thermal overloads in summer due to Category B contingency conditions
    - Lerdo-Lerdo Jct 115 kV #1 Line following loss of Kern Oil-Witco 115 kV Line & Mt Poso #1 Unit (L-1/G-1).
      - Potential Mitigation: Reconductor Lerdo-7th Standard-Kern Oil- 115 kV Line
    - Live Oak-Kern Power 115 kV #1 Line following loss of PSE Live Oak-Kern Oil-Witco 115 kV Line.
    - Ptrl-Jct-Live Oak 115 kV #1 Line following loss of Kern Oil-Witco 115 kV Line & Mt. Poso #1 Unit.
    - Ptrl-Jct-Poso Mt. Jct 115 kV #1 Line following loss of Kern Oil-Witco 115 kV Line & Mt. Poso #1 Unit.
      - Potential Mitigation: Convert Semitropic-Famoso-Kern PP-Kern Oil 70 kV to 115 kV system
- Low Voltage – None
- Voltage Deviation – None

Category C problems will be discussed using the area diagram in the next slide

Kern Area – Results (Category C)

- Thermal Overloads
  - Lerdo Jct-Kern Oil 115 kV #1 Line
  - Petrol-Live Oak 115 kV Line
  - Petrol Jct-Poso MT Jct 115 kV #1 Line
  - Live Oak-Kern PWR 115 kV #1 Line
  - Kern PP #3 230/115kV

- Potential Mitigation
  - Convert the Semitropic-Famoso-Kern PP-Kern Oil 70 kV facilities to 115 kV
  - Install SPS as part of the approved Kern PP 230 kV Area Reinforcement Project for the double Kern PP #4 & #5 Bank outage overloading the #3 Bank

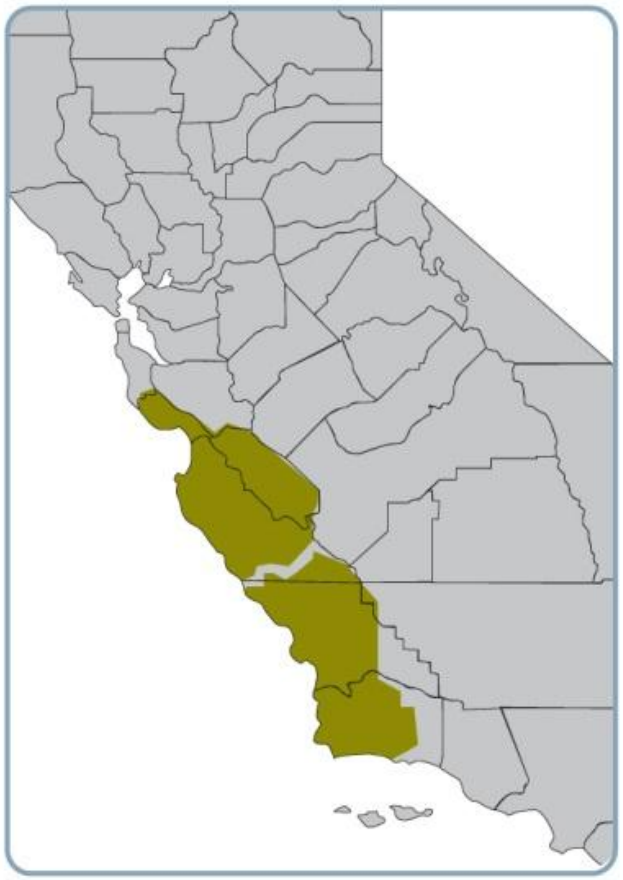


Central Coast and Los Padres Areas Preliminary Reliability Assessment Results

Chris Mensah-Bonsu, Ph.D.
Senior Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Central Coast Area



- Located south of the Greater Bay Area, it extends along the central coast from Santa Cruz to King City
- Major substations: Moss Landing, Green Valley, Paul Sweet, Salinas, Watsonville, Monterey, Soledad and Hollister
- Supply sources: Moss Landing, Panoche, King City and Monta Vista
- Generation: Over 2800 MW in 2016 and approximately 300 MW thereafter.
- Transmission system includes 60, 115, 230 and 500 kV facilities
- 2024 Winter Peak: 714 MW
- 2024 Summer Peak: 802 MW

Central Coast Area Assessment Summary

- The assessment identified:
  - No thermal overloads (summer peak) for 2019 and beyond
  - Thermal overloads (winter peak) due to Category B – 1
  - Thermal overloads (winter peak) due to Category C – 1
  - No low voltages (summer peak) for 2019 and beyond
  - No low voltages (winter peak) for 2019 and beyond
  - No new voltage deviations

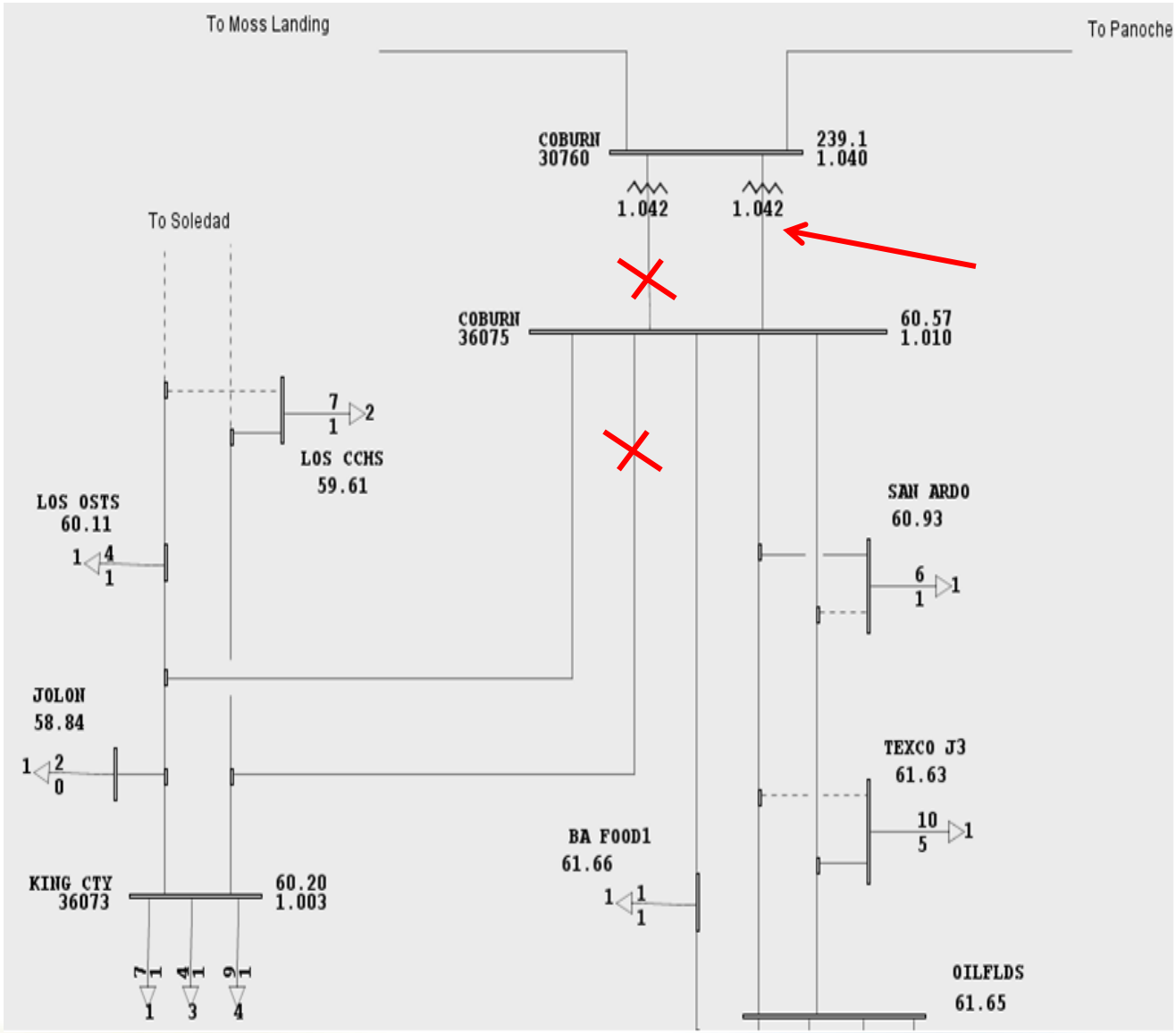
- Compared to last year results:
  - There is only one new winter thermal overload concern identified
  - The Crazy Horse 115 kV Substation, Moss Landing 115/230 kV Bank #1 & 2 Replacement, Moss Landing BAAH and Watsonville 115 kV Voltage Conversion projects mitigate previously identified Category B and C thermal loading and low voltage concerns.

Central Coast Area – Results (Category A & B)

- Thermal Overloads
  - No thermal overloads due to Category A contingency conditions
  - 1 thermal overloads in Winter due to Category B contingency conditions at 103% in 2016 and reduces to 100% in 2024
    - Coburn 230/60 kV #2 Bank following Coburn 230/60 kV #1 Bank outage.
      - Potential Mitigation: Replace with higher rated bank
- Low Voltage – None
- Voltage Deviation – None

Category C problems will be discussed using the area diagram in the next slide

Central Coast Area – Results (Category C)



Thermal Overloads

- Coburn 230/60 kV #2 Bank following Coburn 230/60 kV #1 Bank & Coburn-King City 60 kV #1 Line outages.

Potential Mitigation

- Replace with higher rated bank or SPS

Los Padres Area

- Located south of the Central Coast Division
- Major substations : Paso Robles, Atascadero, Morro Bay, San Luis Obispo, Mesa, Divide, Santa Maria and Sisquoc
- Key supply sources include Gates, Midway and Morro Bay
- Generation: Over 900 MW
- Diablo Canyon nuclear power plant (2400 MW) is located in Los Padres but does not serve the area
- Transmission system includes 70, 115, 230 and 500 kV facilities
- 2024 Summer Peak: 641 MW

Los Padres Area Assessment Summary

- The assessment identified:
  - No new thermal overloads due to Category A or B contingency conditions
  - New thermal overloads due to Category C - 2
  - There are no low voltage concerns
  - There are no voltage deviation concerns
- Compared to last year results:
  - 2 new thermal overloads due to Category C conditions were identified
  - Last year, transmission projects were approved in this area

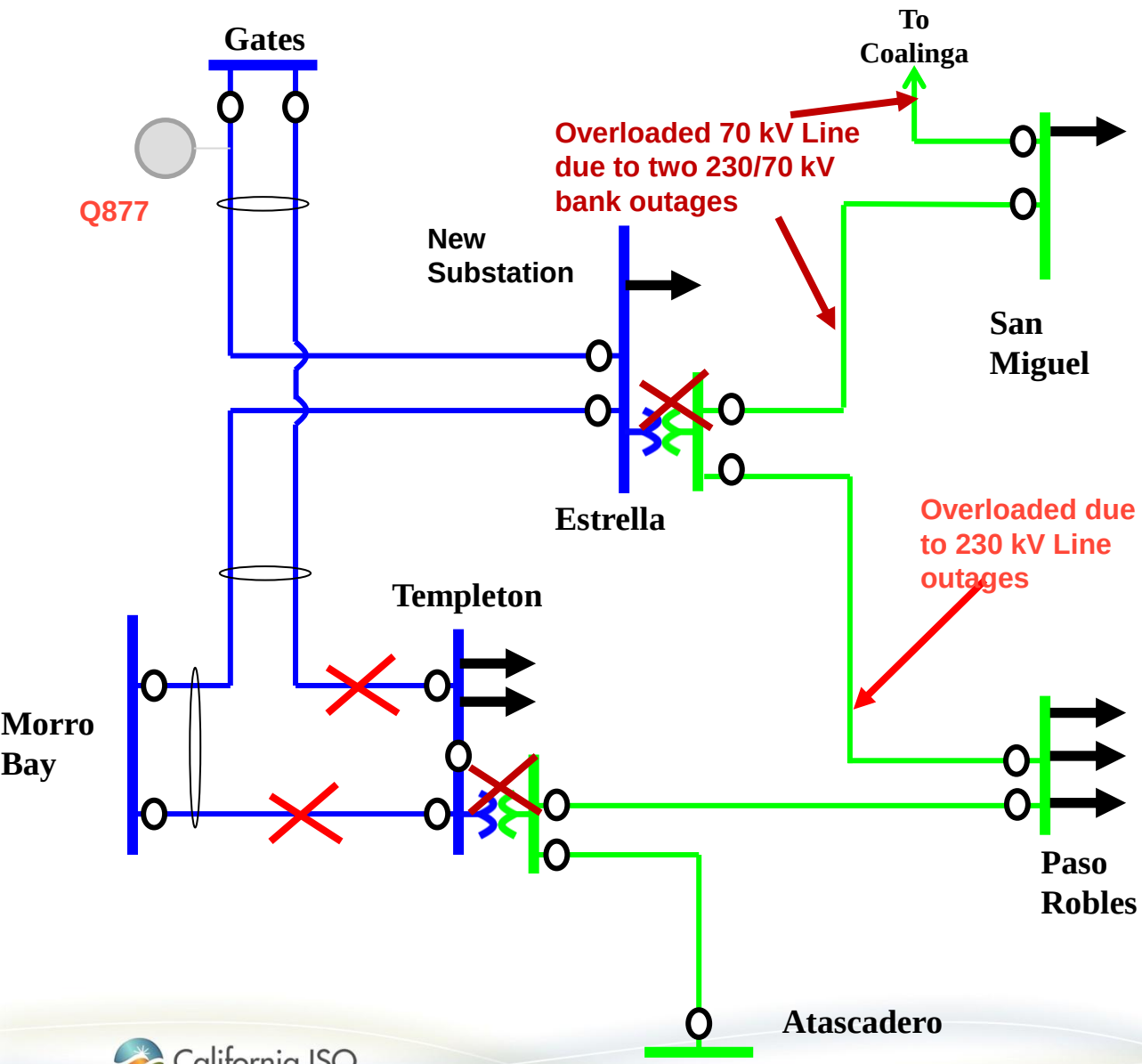
Los Padres Area – Results (Category A & B)

- Thermal Overloads
  - No new thermal overloads due to Category A or B contingency conditions

- Low Voltage – None
- Voltage Deviation – None

Category C problems will be discussed using the area diagram in the next slide

Los Padres Area – Results (Category C)



- Thermal Overloads
  - Estrella-San Miguel-Coalinga 70 kV #1 Line following Estrella 230/70 kV & Templeton 230/70 kV Bank outages (C3).
  - Estrella- Paso Robles 70 kV #1 Line following Morro Bay-Templeton & Templeton-Gates 230 kV Line outages (C3).
- Potential Mitigation
  - Install SPS to trip Q877 project as part of the Estrella Project

San Francisco Peninsula, Extreme Event Assessment 2014-2015 Transmission Planning Process

Available on Market Participant Portal

Confidential – Subject to Transmission Planning NDA

J.E. Billinton
Manager, Regional Transmission - North

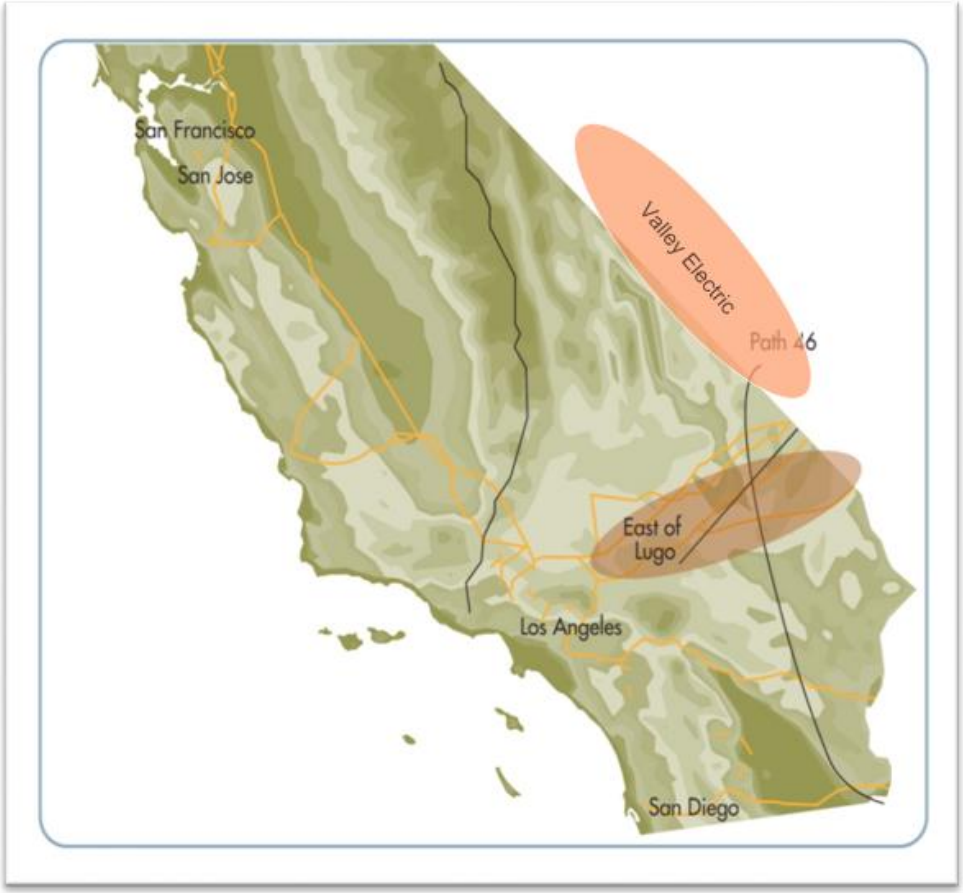
2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Valley Electric Area
Preliminary Reliability Assessment Results

Sushant Barave
Sr. Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Valley Electric Area



- VEA system is connected to WAPA's Mead 230kV substation, WAPA's Amargosa 138kV substation, NV Energy's Northwest 230kV and shared buses at Jackass 138kV and Mercury 138kV
- Generation Modeled:
  - 0 MW in 2016, 2019 and 2024
- Comprised of 138 and 230 KV transmission facilities under ISO control
- Summer Peak load of 135 MW in 2016

Valley Electric Area Assessment Summary

- The assessment identified:
  - 2 buses with voltage deviation issues due to category B outages (peak)
  - 23 buses with high/low voltage concerns for Category C outages (peak and off-peak)
  - 19 buses with voltage deviation concerns for Category C outages (peak)
  - 4 facility overloads due to Category C outages (peak)

- Compared to last year results:
  - Very similar to last year's results owing to the fact that planned upgrades modeled in this year's TPP are the same as last year's

Valley Electric Area Potential Solutions

- Potential Mitigation Solutions
  1) Operate VEA 138 kV system radially after the first N-1 for Category C3 issues
  2) Congestion management or operational action plan for Bob – Mead 230kV overload
  3) Set the UVLS to monitor the HV side OR lock LTCs of VEA transformer banks after the first N-1 contingency for Category C3 issues

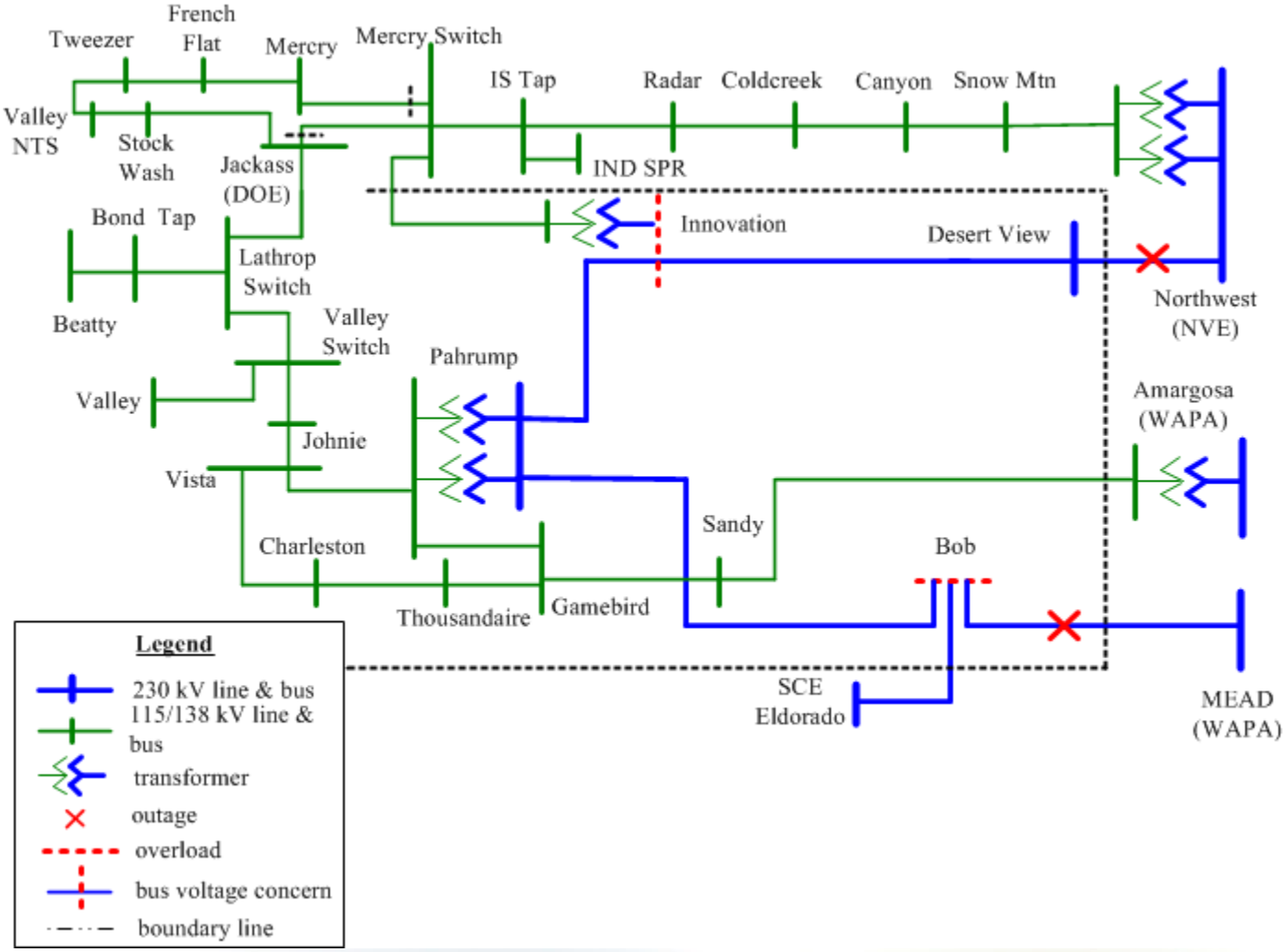
Valley Electric Area – N-1 Issue

- Voltage deviation

  Over 5% voltage drop at Innovation 230kV ((2016, 2019 and 2024) and Bob 230kV (2016)

- Potential Mitigation

  An exception OR dynamic reactive support



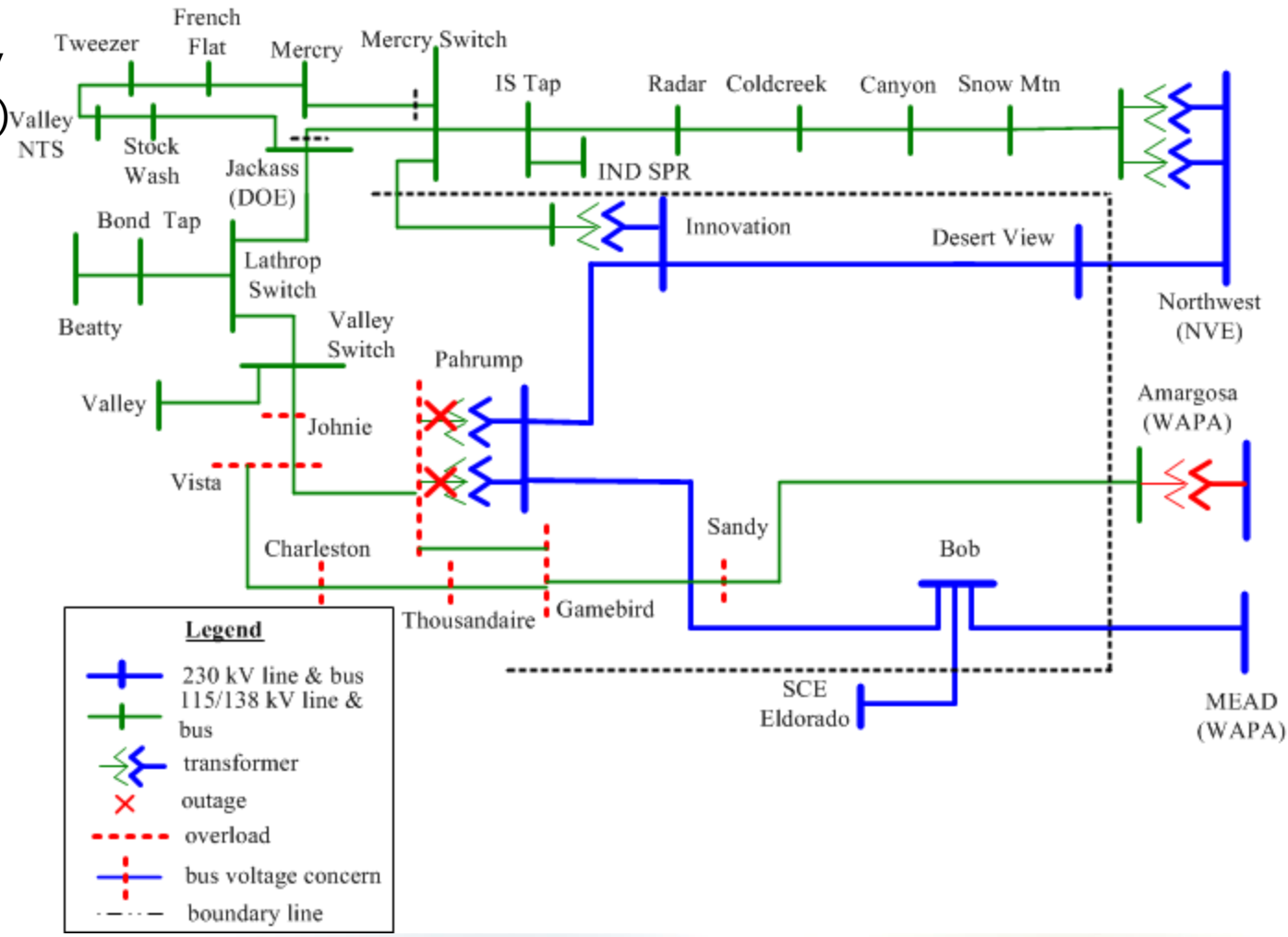
Valley Electric Area – N-1-1 Issue (1)

- Overload

  Amargosa 230/138kV bank (2019 and 2024)
- Voltage Concerns

  Deviations and low voltages along the Southern 138kV system in VEA
- Potential Mitigation

  Rely on UVLS or radially serve VEA 138 kV system after the 1st outage



Valley Electric Area – N-1-1 Issue (2)

- Overload

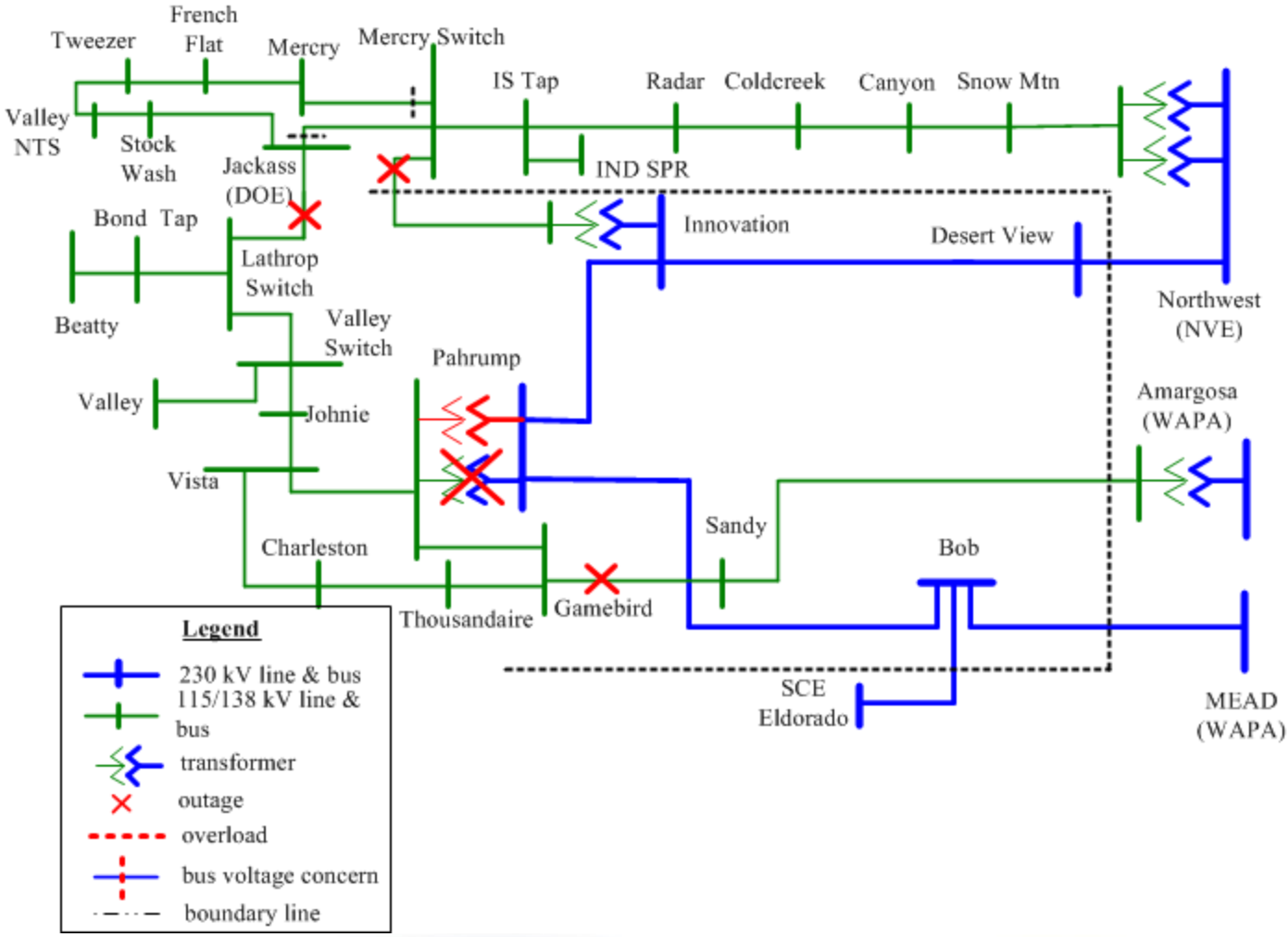
  Pahrump 230/138kV Bank (2019 and beyond)

- Potential Mitigation

  Radialize 138kV system after the first N-1 to limit the amount of load being served from Pahrump

  OR

  A short-term rating on Pahrump banks



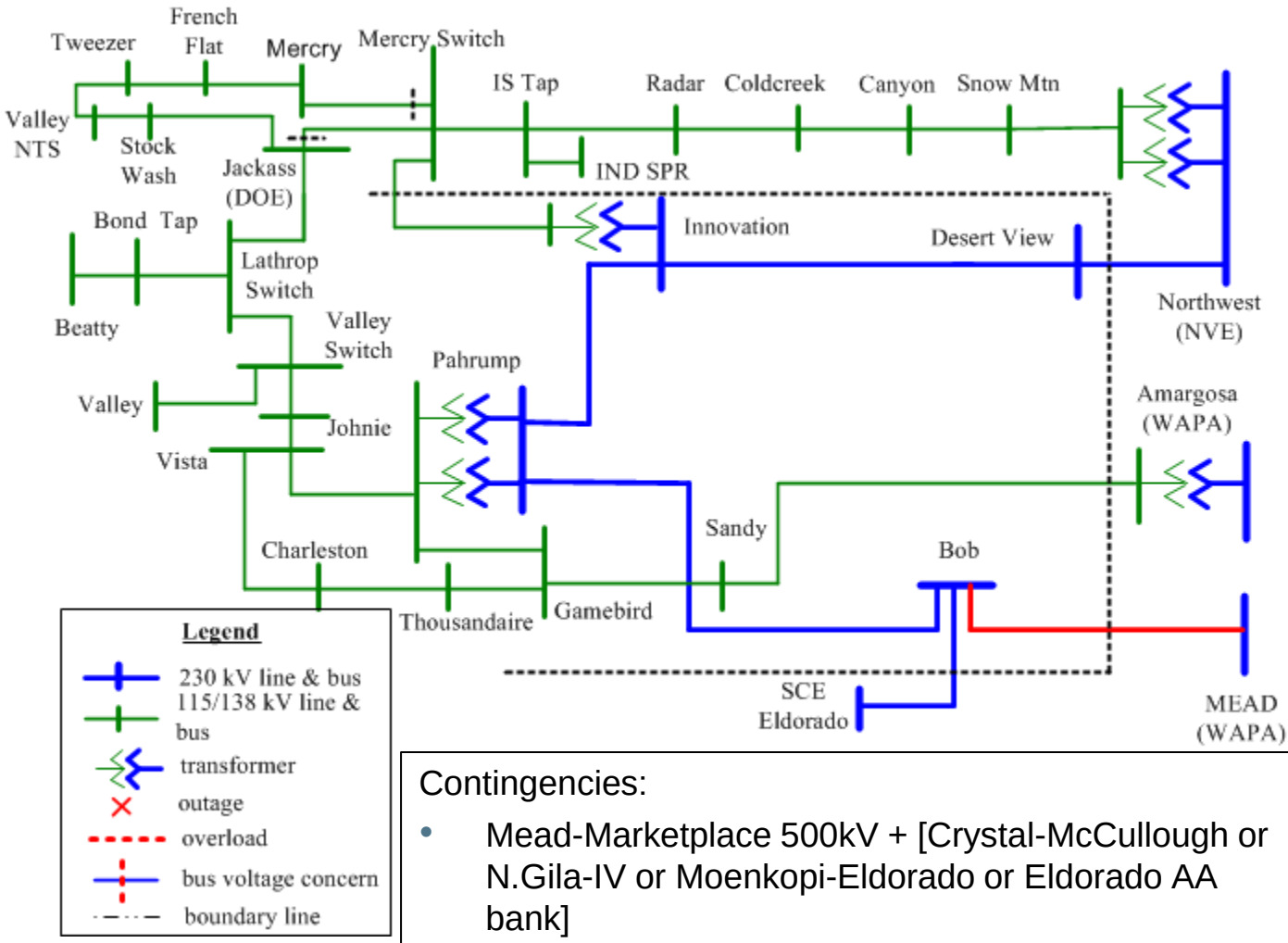
Valley Electric Area – N-1-1 Issue (3)

- Overload

  Mead – Bob 230 kV line (2024)

- Potential Mitigation

  Congestion management or operational action plan



Contingencies:

- Mead-Marketplace 500kV + [Crystal-McCullough or N.Gila-IV or Moenkopi-Eldorado or Eldorado AA bank]
- Lugo-Victorville 500kV + Eldorado-McCullough 500kV

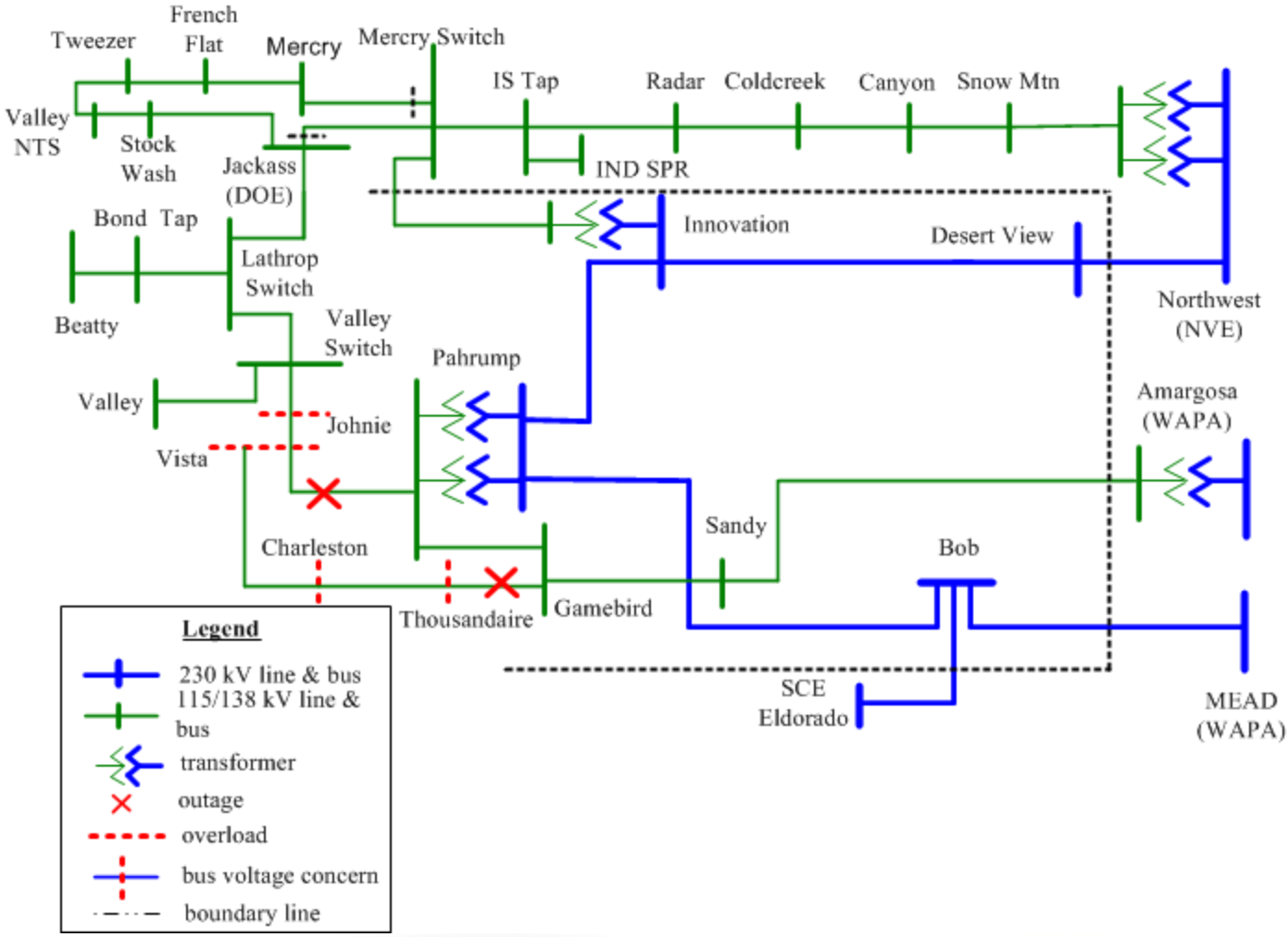
Valley Electric Area – N-1-1 Issue (4)

- Voltage deviation and low voltage

  Vista, Thousandaire, Charleston and Johnnie 138kV

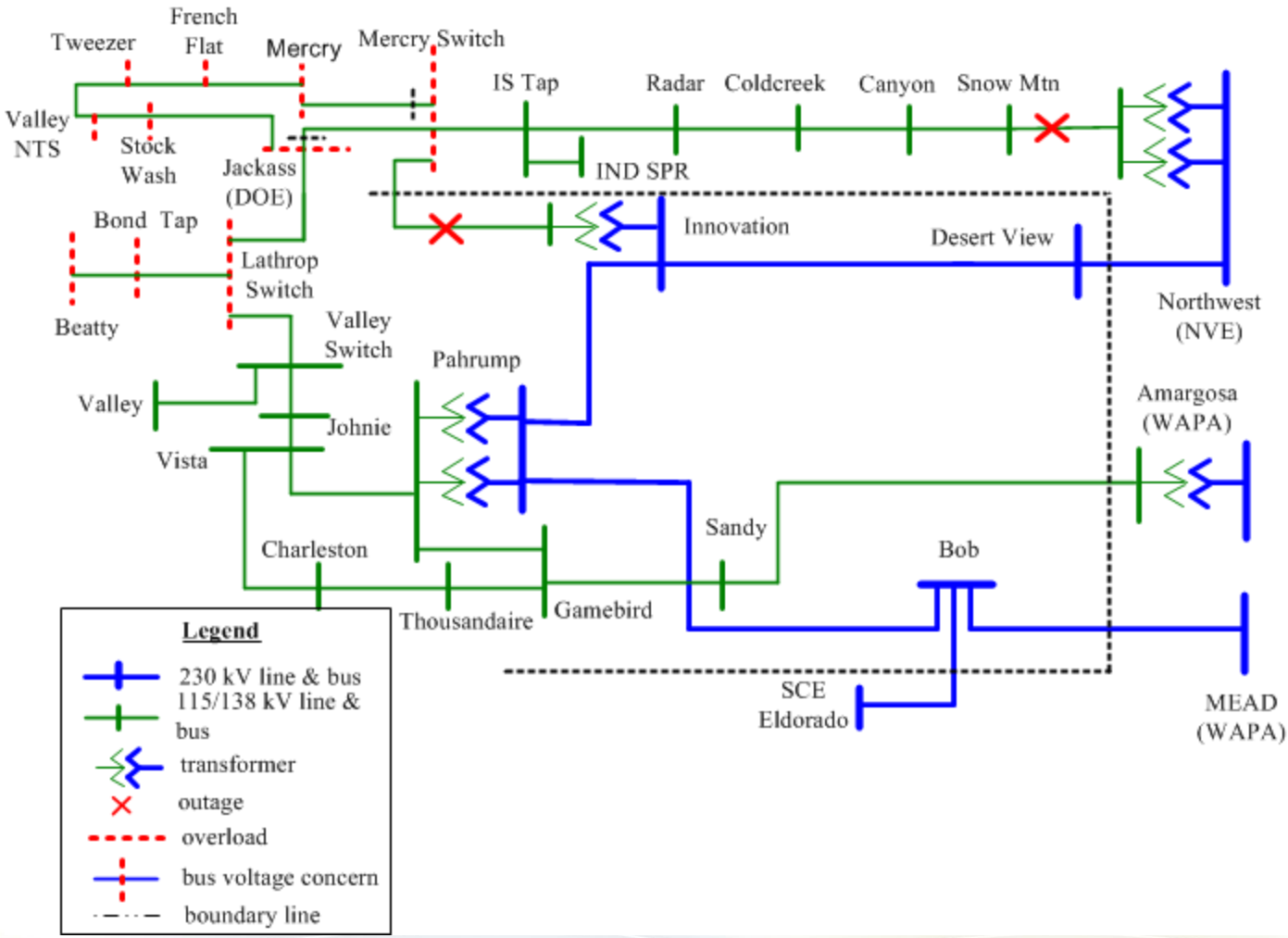
- Potential Mitigation

  Operational action plan (Radialize the 138kV system after the first N-1 contingency)



Valley Electric Area – N-1-1 Issue (5)

- Voltage deviation and low voltage
  - DOE load buses and surrounding 138kV buses
- Potential Mitigation
  - Operational action plan (Radialize the 138kV system after the first N-1 contingency)



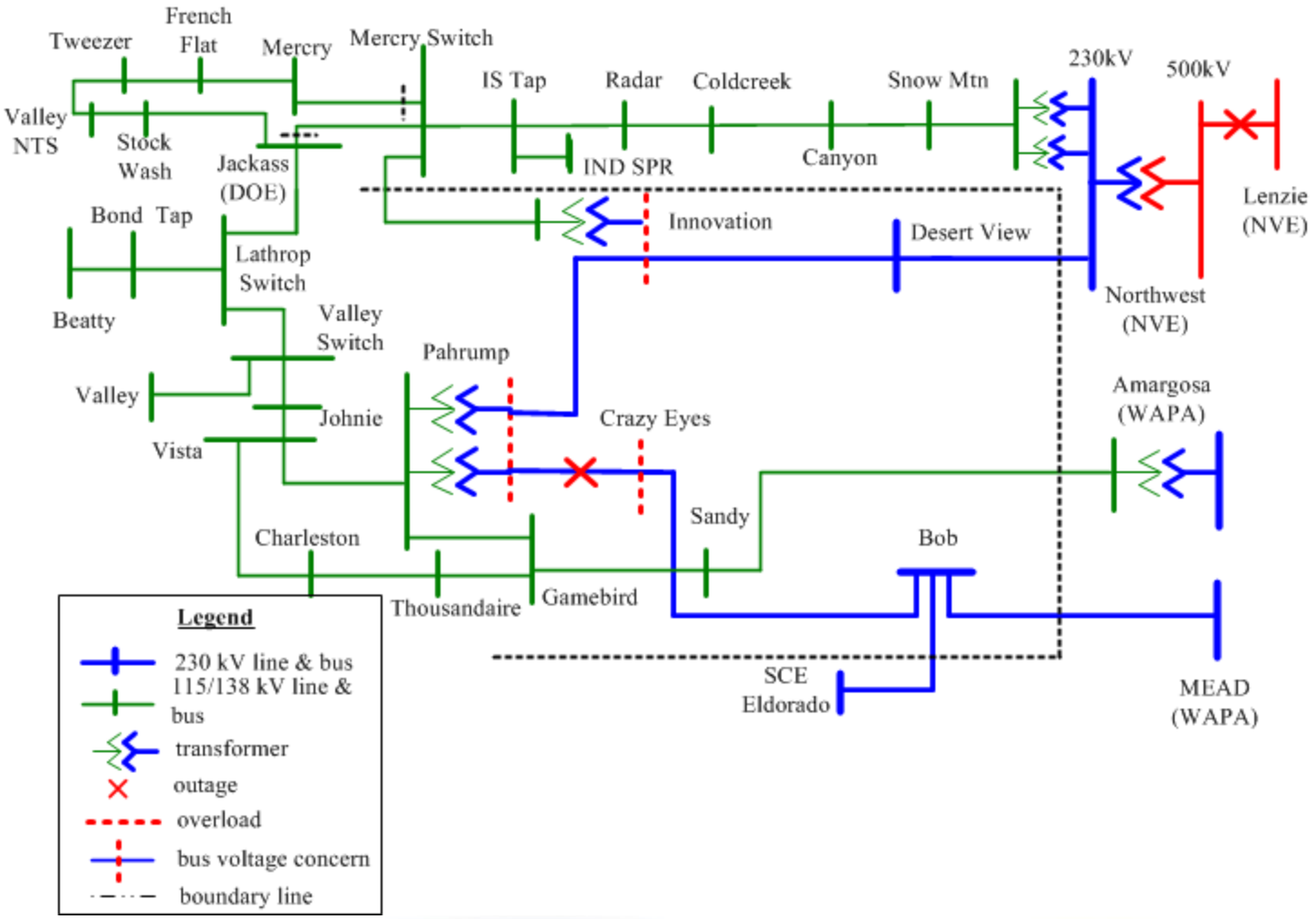
Valley Electric Area – N-1-1 Issue (6)

- Voltage deviation and low voltage

  Pahrump, Innovation and Crazy Eye 230kV

- Potential Mitigation

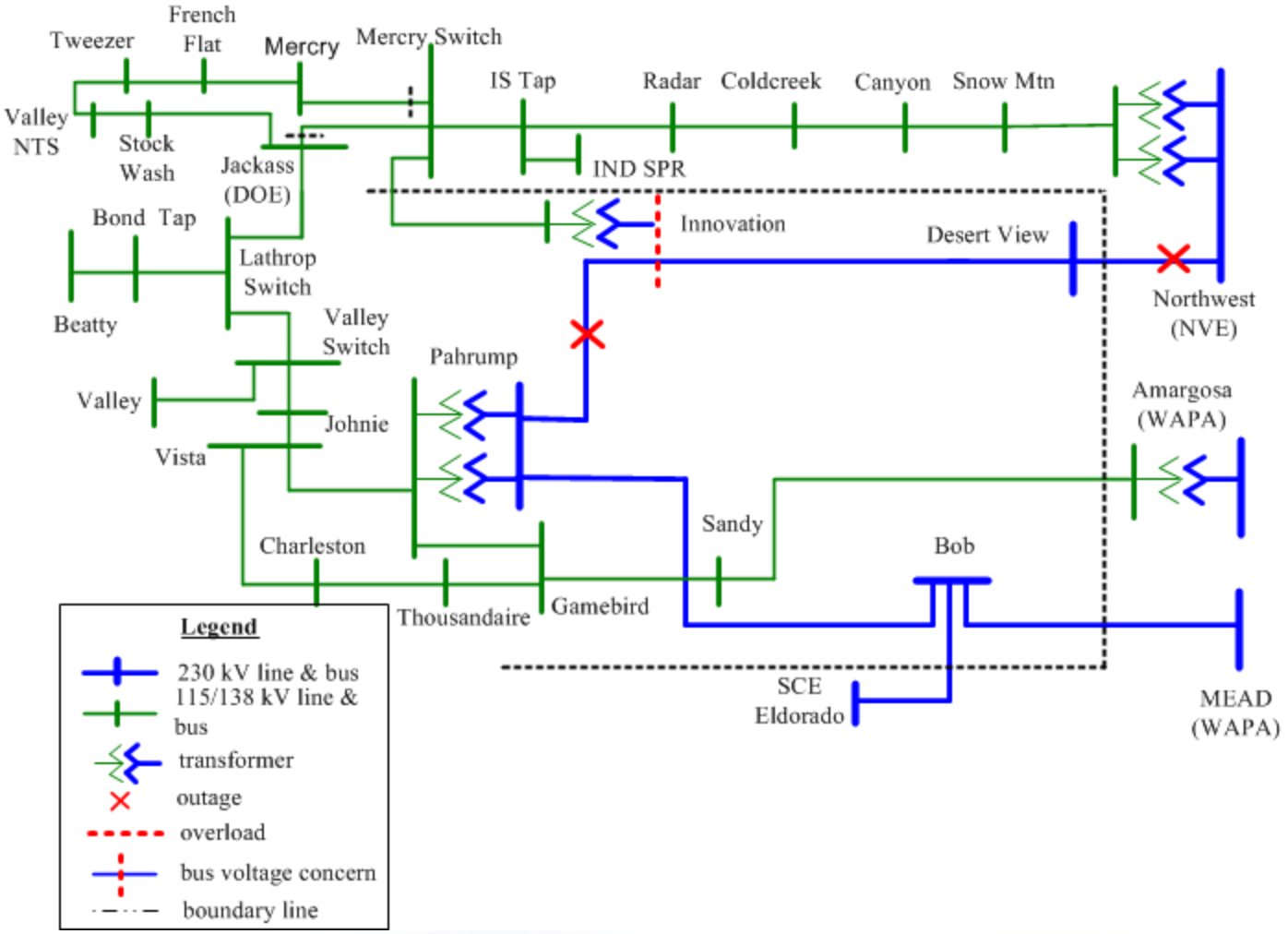
  Operational action plan (Radialize the 138kV system after the first N-1 contingency)



Valley Electric Area – N-1-1 Issue (7)

- Voltage deviation at Innovation 230kV
- Potential Mitigation

  Operational action plan (Radialize the 138kV system after the first N-1 contingency) or rely on UVLS

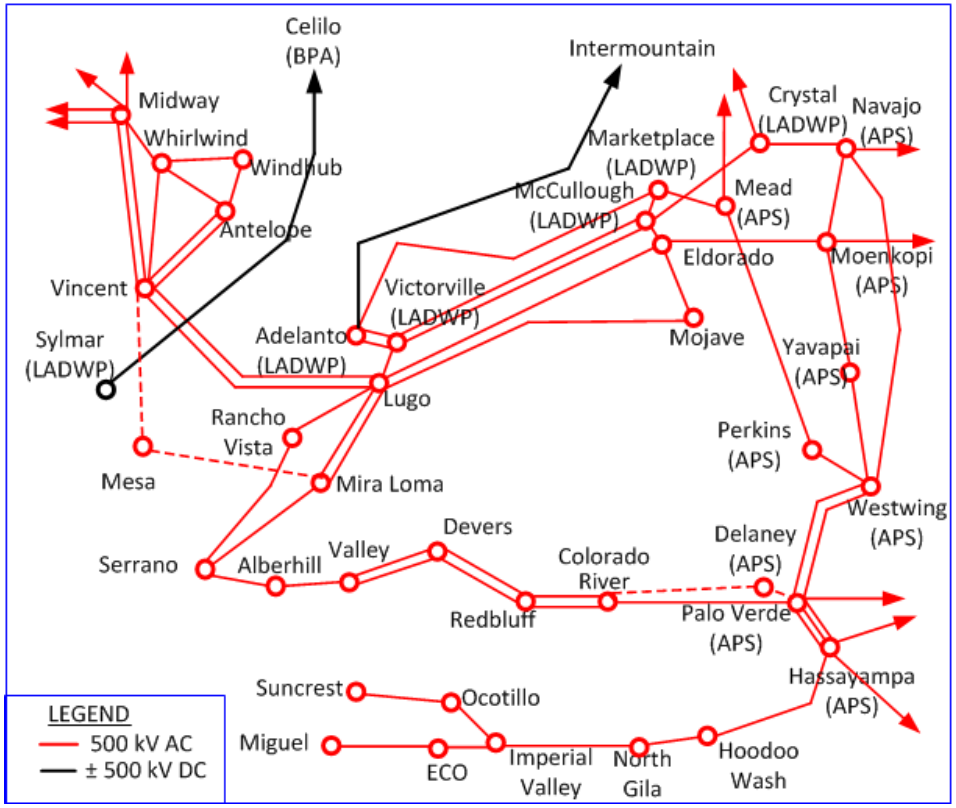


SCE Bulk System
Preliminary Reliability Assessment Results

Nebiyu Yimer
Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

SCE Bulk System



- Includes SCE's 500 kV system and interconnections with PG&E, SDG&E, LADWP, and APS
- About 25,000 MW of total existing generation
- Total SCE Area 1-in-10 Summer Peak load – 28,300 MW (26,867 MW with AAEE)
- Existing and authorized preferred resources were modeled per the study plan
- Uncertainty regarding location of authorized 2012 LTPP resources and existing DR remains

SCE Bulk System Assessment Summary

- The assessment identified:

  Before utilizing DG, ES, DR and other system adjustments:

  - Thermal overload due to Category C – 1
  - Voltage instability due to Category C – 1

  After utilizing DG, ES, DR and other system adjustments:

  - No issues identified

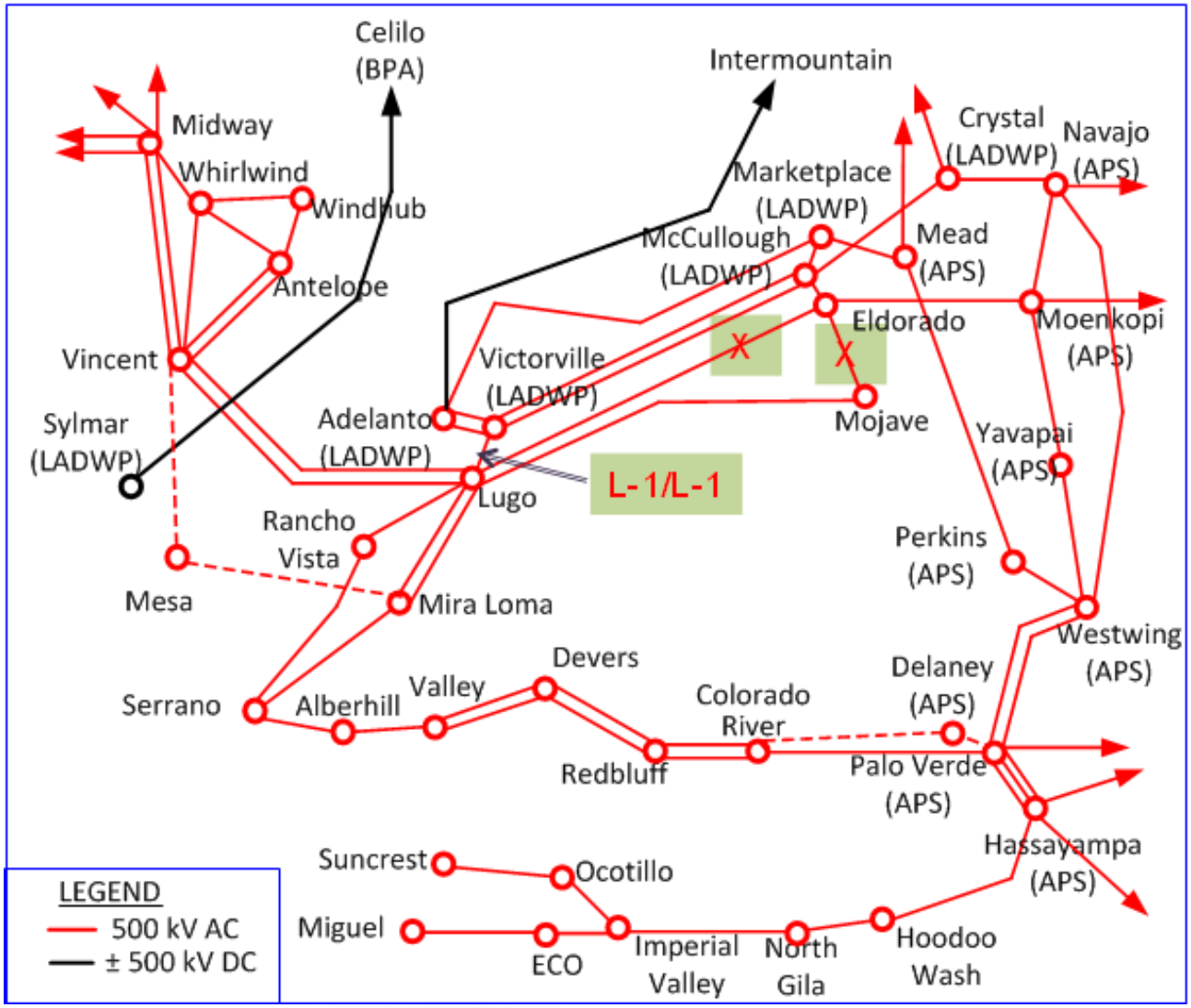
- Compared to last year results:
  - One new thermal loading issue
  - Approved/authorized transmission and resource additions addressed voltage instability issue

SCE Bulk System Potential Solutions

- Potential Mitigation Solutions
  - Utilize available DG, DR, ES and other system adjustments,
  - Increase emergency ratings of a 500 kV tie-line (LADWP) or
  - Add 500 kV series reactors

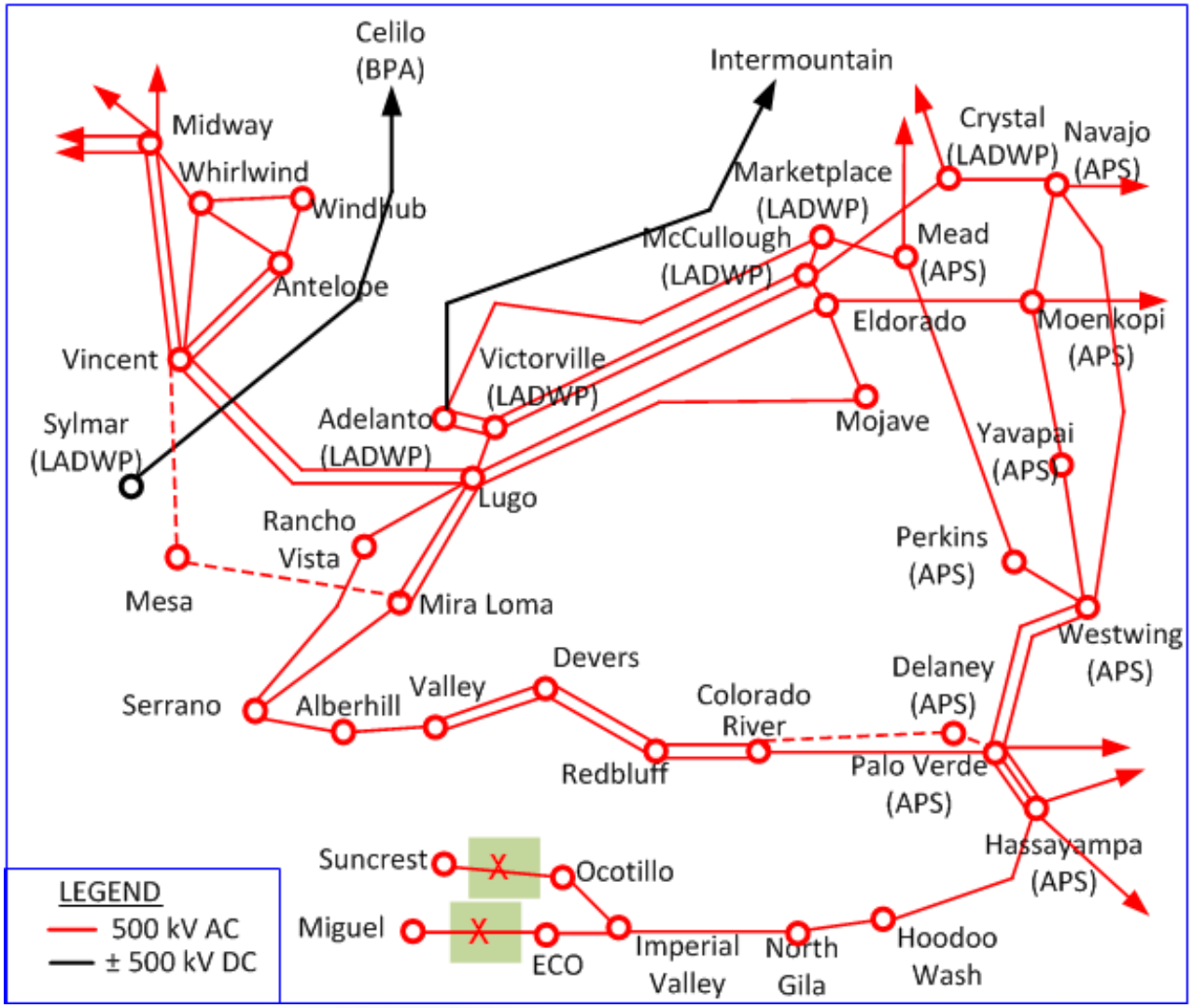
SCE Bulk System – Results

- Thermal overload
  - Lugo–Victorville (LADWP) 500 kV line (L-1/L-1, 2024 SP)
- Potential Mitigation
  - Utilize available DG, ES, DR and other system adjustments
  - Increase emergency ratings of the line or
  - Add series reactors



SCE Bulk System – Results

- Voltage instability (All SP cases)
  - L-1/L-1 outage of Sunrise and SWPL 500 kV lines without system adjustment and safety net
- Potential Mitigation
  - Utilize available generation, DG, ES, DR and other system adjustments including adjusting approved Imperial Valley phase shifter.

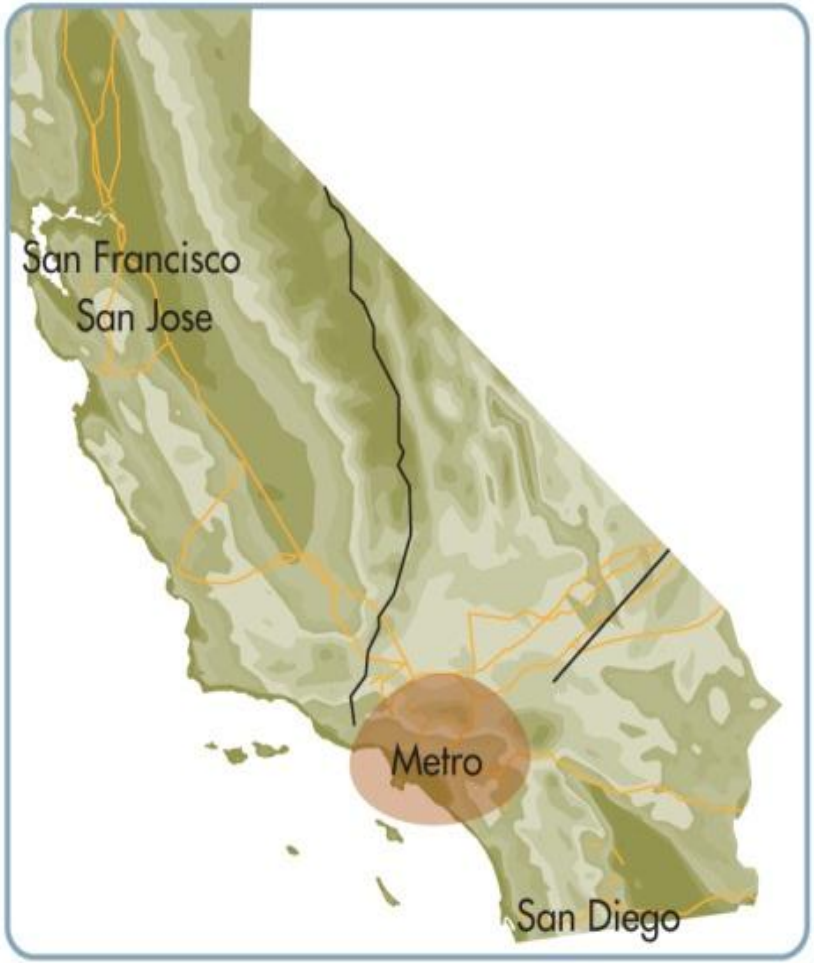


SCE Metro Area
Preliminary Reliability Assessment Results

Nebiyu Yimer
Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Metro Area



- Includes Los Angeles, Orange, Ventura and Santa Barbara counties, and parts of Riverside and San Bernardino counties
- About 13,000 MW of existing generation
- Comprised of 500 and 230 kV transmission facilities
- 1-in-10 Summer Peak load of about 23,830 MW in 2024 (23,050 MW including AAEE)
- Existing and authorized preferred resources were modeled per the study plan
- Uncertainty regarding location of authorized 2012 LTPP resources and some existing DR remains

Metro Area Assessment Summary

- The assessment identified:

  Before utilizing DG, ES, DR and other system adjustments:

  - Thermal overload due to Category B – 1
  - Voltage deviation due to Category B – 1
  - Thermal overload due to Category C – 6

  After utilizing DG, ES, DR and other system adjustments:

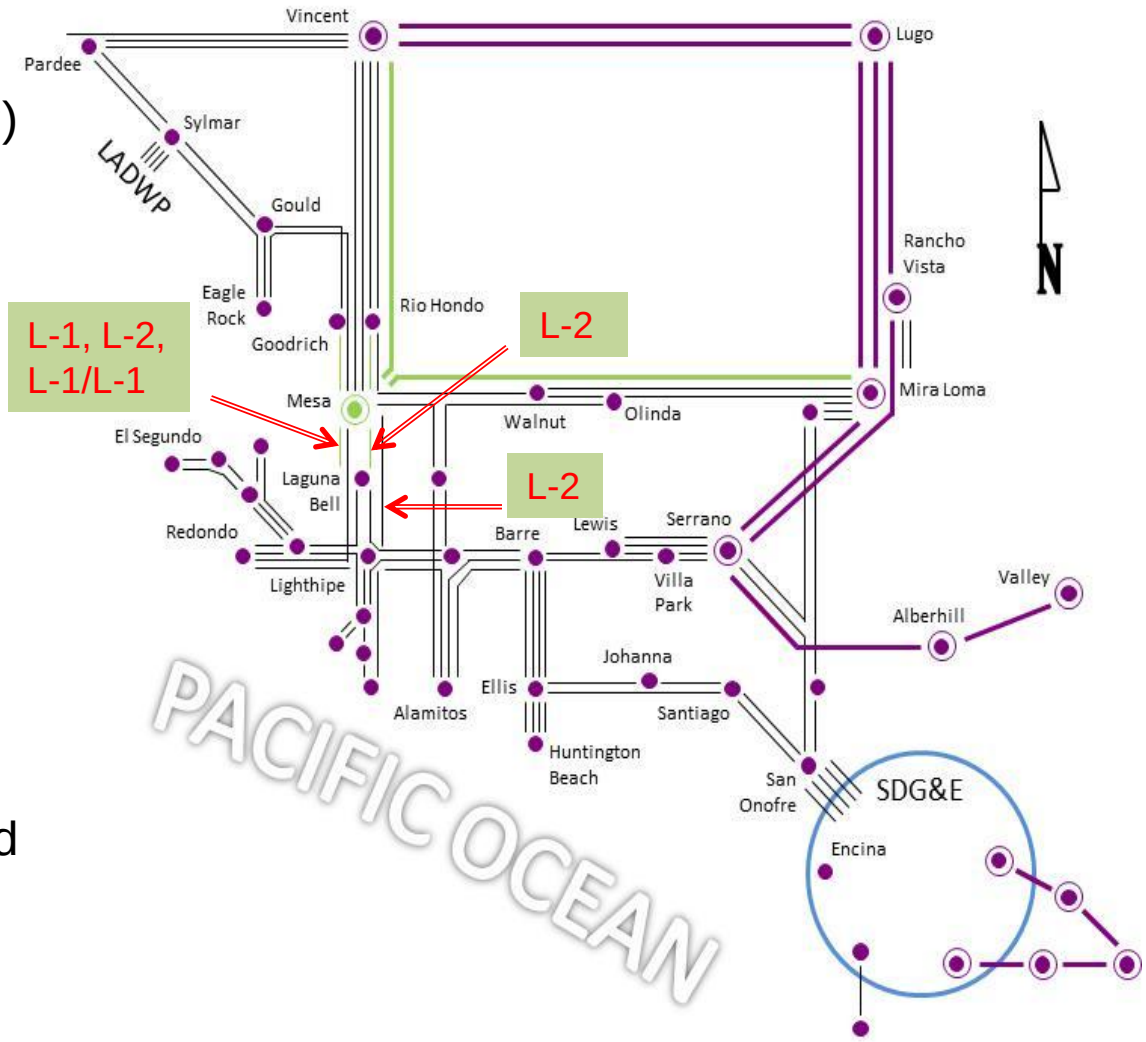
  - Voltage deviation due to Category B – 1
  - Thermal overload due to Category C – 1
- Compared to last year results:
  - 3 new loading issues
  - Approved/authorized transmission and resource additions helped in addressing 10 loading issues.
  - 1 new voltage deviation issue

Metro Area Potential Solutions

- Potential Mitigation Solutions
  - Increase emergency ratings of up to 3 lines
  - Utilize available preferred resources
  - System adjustments after contingencies

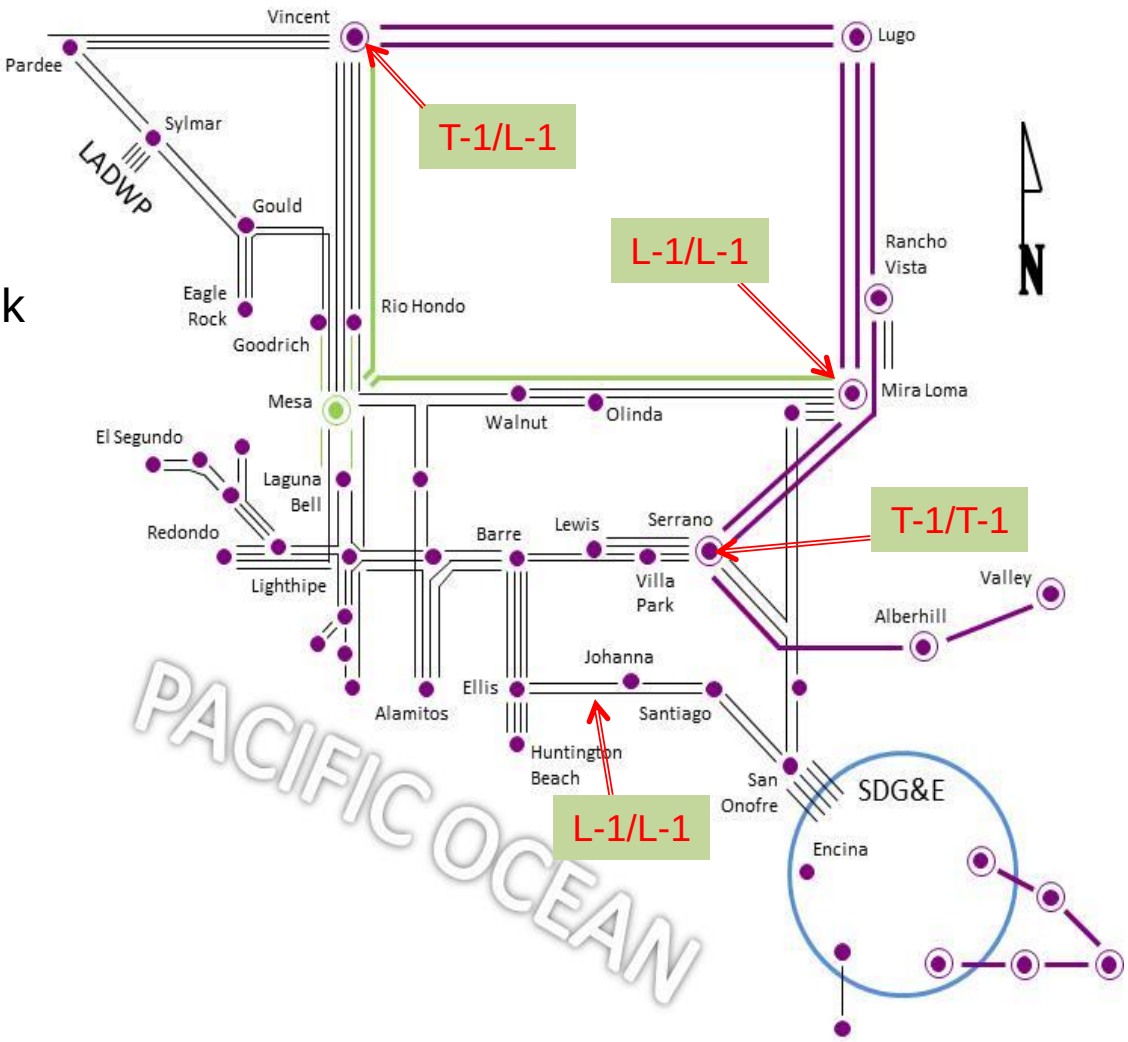
Metro Area Results

- Thermal overloads (2024SP)
  - Mesa–Laguna Bell #1 230 kV line (L-1, L-2, L-1/L-1)
  - Mesa–Laguna Bell #2 230 kV line (L-2)
  - Mesa–Litehipe 230 kV line (L-2)
- Potential Mitigation
  - Increase emergency ratings of the three lines
  - Utilize available preferred resources
  - Close Mesa 230 kV bus



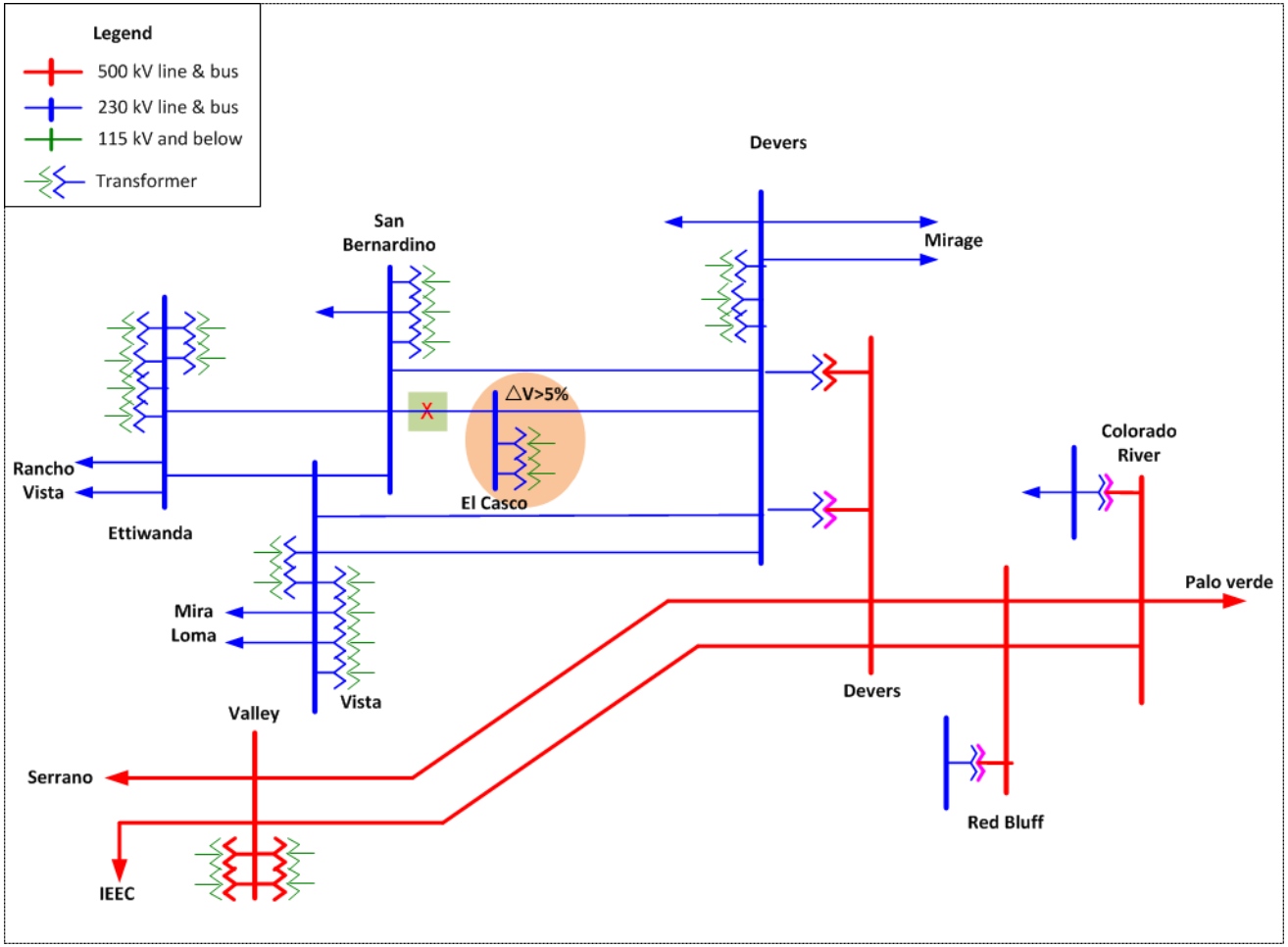
Metro Area Results – Cont'd

- Thermal overload
  - Ellis–Santiago 230 kV line (L-1/L-1,19 SP)
  - Vincent 500/230 kV #1 bank (T-1/L-1, 24 SP)
  - Mira Loma 500/230 kV #4 bank (L-1/L-1, 16 SP &19 SP)
  - Serrano 500/230 kV banks (T-1/T-1, 24 SP)
- Potential Mitigation
  - Utilize DG, ES, DR and other system adjustments



Metro Area Results – Cont'd

- Voltage deviation
  - EL Casco 230/115 kV system (L-1,16 OP)
- Potential Mitigation
  - Temporary exception from voltage deviation standard



SCE Eastern Area
Preliminary Reliability Assessment Results

Nebiyu Yimer
Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

SCE Eastern Area

- Includes the SCE owned transmission system in the Riverside County around and west of the Devers Substation
- Generation: over 2,500 MW of generation
- Comprised of 500, 230 and 161 kV transmission facilities.
- Summer Peak load of 1100 MW in 2024

SCE Eastern Area Assessment

- The assessment identified:

  Without allowable system adjustments:

  - Voltage/transient instability due to Category C - 2
  - High voltage due to Category C – 1

  With allowable system adjustments:

  - No issues identified

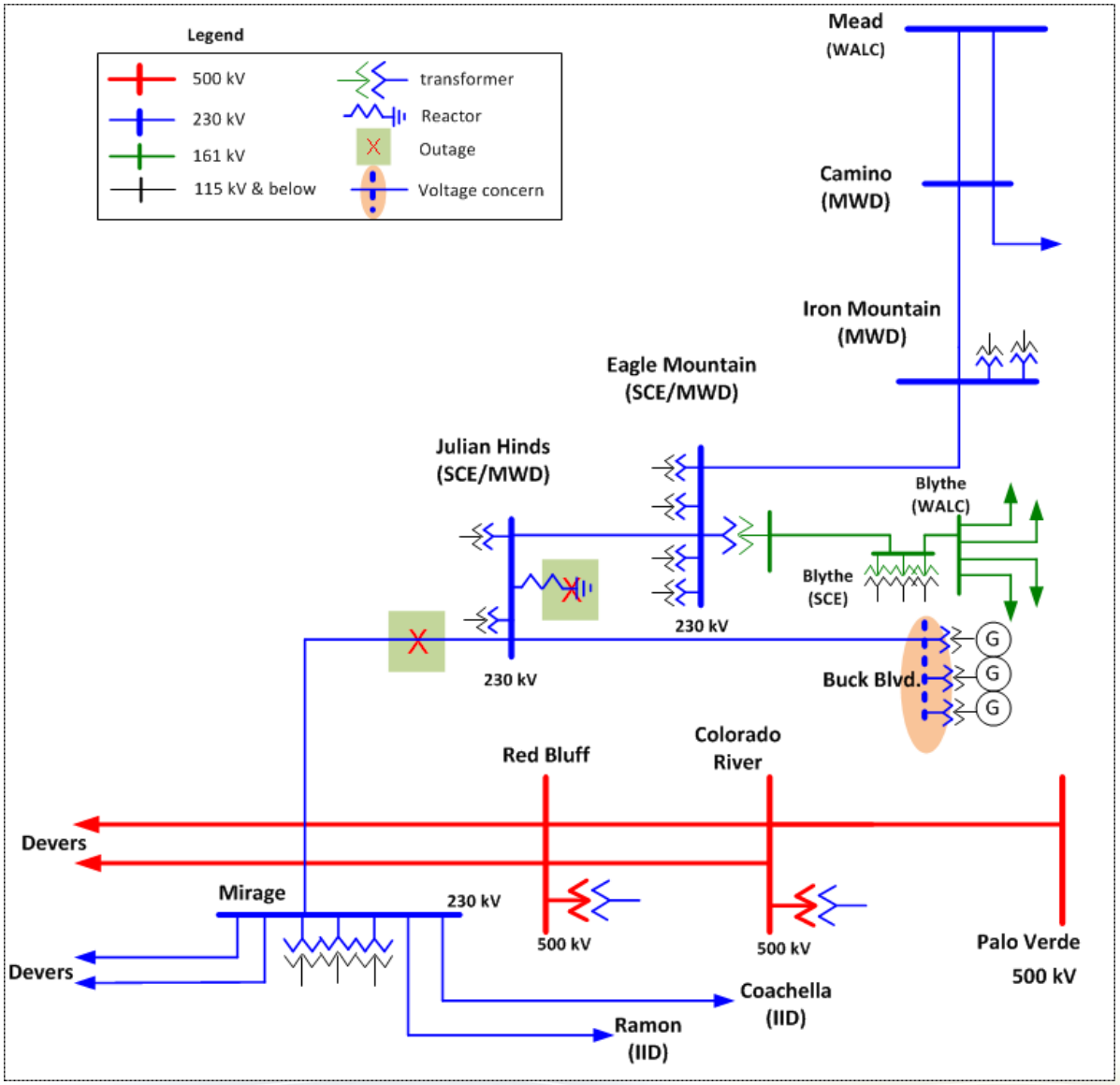
- Compared to last year results:
  - 1 new high voltage problem

SCE Eastern Area Proposed Solutions

- Potential Mitigation Solutions
  - System adjustment after contingency

SCE Eastern Area – Results

- High Voltage
  - Buck Blvd. substation (N-1/N-1)
- Potential Mitigation:
  - System adjustment after contingency



Tehachapi and Big Creek Corridor Preliminary Reliability Assessment Results

Sanjay Patil
Senior Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Tehachapi and Big Creek Corridor Area

- Comprised of 230 kV transmission facilities.
- Over 6,518 MW of existing generation.
- Existing pumping load of 720 MW.
- Summer Peak load of 2,280 MW in 2024.

Tehachapi and Big Creek Corridor Area Assessment Summary

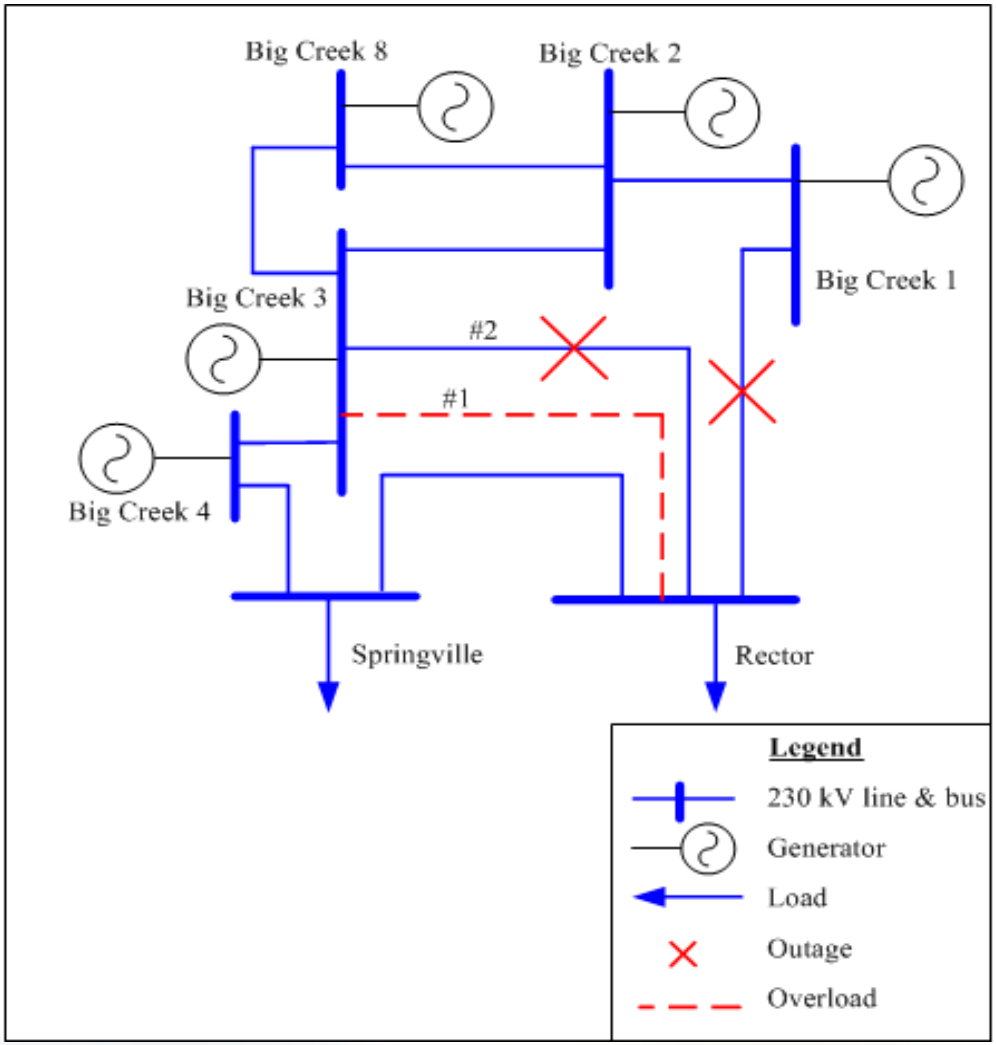
- The assessment identified:
  - Thermal overload due to one Category C3 contingency.
- Compared to last year results:
  - The above concerns were not identified in last year's analysis.

Tehachapi and Big Creek Corridor Area Potential Solutions

- Potential Mitigation Solutions
  - Manually reduce big creek generation after first contingency to mitigate overload for the second contingency.

Tehachapi and Big Creek Corridor Area – Results

- Thermal overload
  - Big Creek 3 - Rector #1 230 kV overloaded for the outage of Big Creek 1-Rector #1 & Big Creek 3-Rector #2 230 kV.
- Potential Mitigation
  - Manually reduce big creek generation after the first contingency to mitigate overload for the second contingency.



North of Lugo Area
Preliminary Reliability Assessment Results

Sushant Barave
Sr. Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

North of Lugo Area

- Comprised of 55, 115, and 230 kV transmission facilities.
- Over 2,900 MW of existing generation.
- Summer Peak load of 1,426 MW in 2024.

North of Lugo Area Assessment Summary

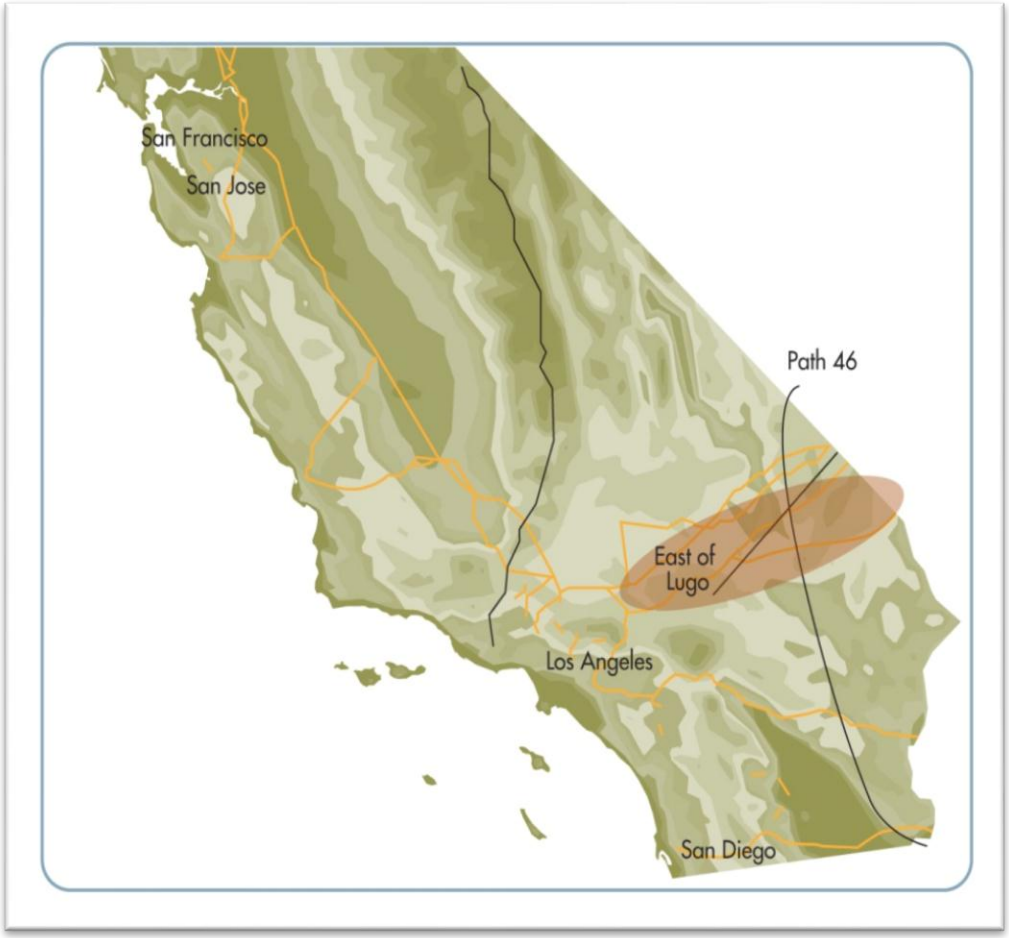
- The assessment identified:
  - No issues
- Compared to last year results:
  - Generation in North of Inyokern area was dispatched in a way such that no overloads resulted on the downstream system
  - Victor loop-in project was modeled

East of Lugo Area
Preliminary Reliability Assessment Results

Sushant Barave
Sr. Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

East of Pisgah Area



- Includes Eldorado, Mohave, Merchant, Ivanpah, CIMA, Pisgah Mountain Pass, Dunn Siding and Baker substations
- Generation:
  - 970 MW
- Comprised of 115, 230 & 500 kV transmission facilities.
- Summer Peak load of 14 MW in 2024

East of Pisgah Area Assessment Summary

- The assessment identified:
  - 1 overloads due to Category C outages
- Compared to last year results:
  - Same overload observed last year

East of Pisgah Area Proposed Solutions

- Potential Mitigation Solutions

- Mitigation for Lugo-Victorville 500kV overload: Same as the mitigations discussed in SCE bulk system results
  - System adjustments after initial contingency including bypassing series caps per ISO OP 6610, dispatching Preferred Resources and Energy Storage (PR&ES) or 2)
  - Increase the emergency rating of the line (LADWP Portion)
  - Install series reactors to limit flows on the line

East of Pisgah Area – N-1-1 issue (1)

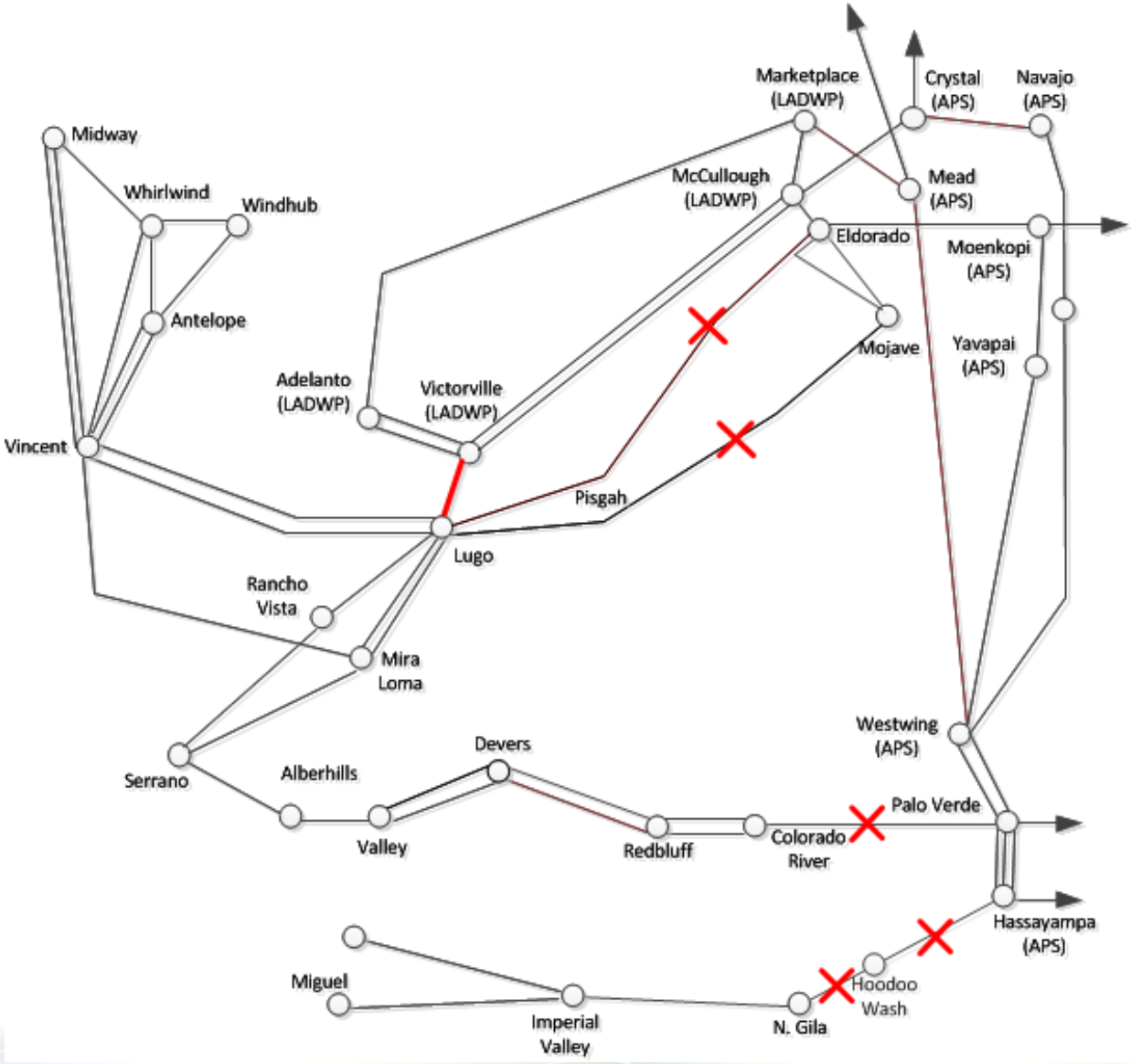
- Thermal Overload

  Lugo – Victorville 500kV (2024)

- Potential Mitigation

Same as the mitigations discussed in SCE bulk system results

- System adjustments after initial contingency including bypassing series caps per ISO OP 6610, dispatching Preferred Resources and Energy Storage (PR&ES) or 2)
- Increase the emergency rating of the line (LADWP Portion)3)
- Install series reactors to limit flows on the line.

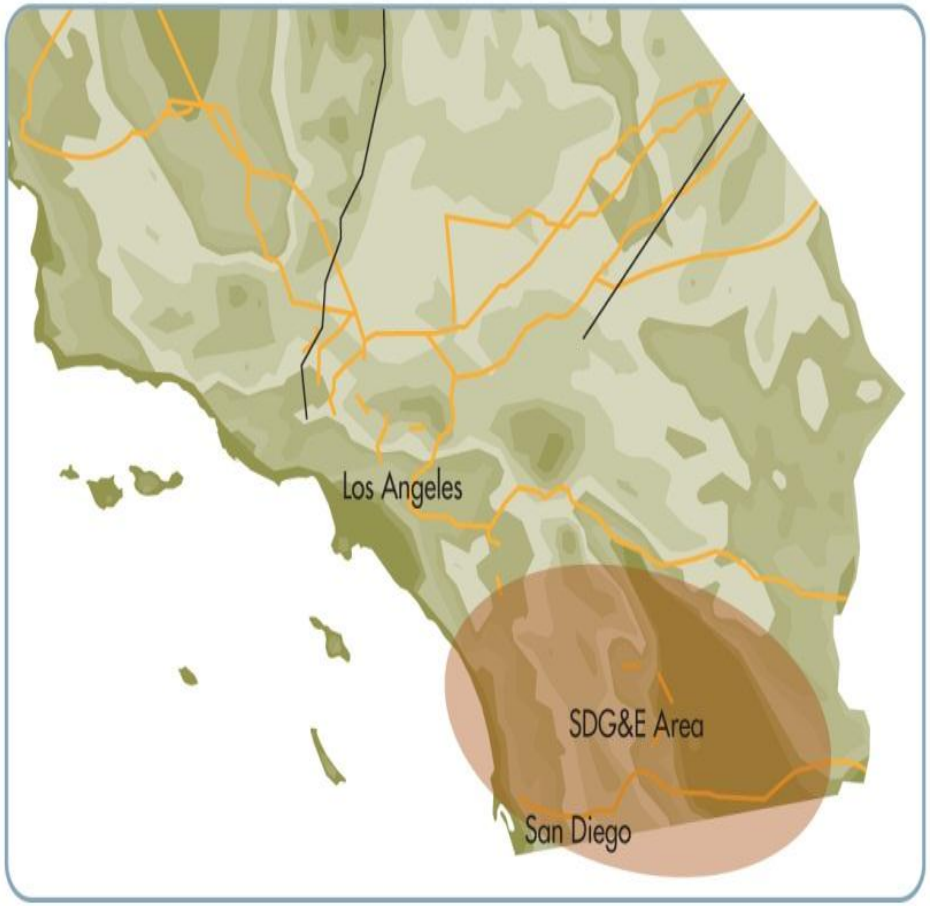


San Diego Gas & Electric Area
Preliminary Reliability Assessment Results

Frank Chen
Sr. Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

SDG&E Area



- Consisted of main transmission facilities (230/500kV) and sub-transmission facilities(69/138kV)
- Generation: Over 4,700 MW of qualifying capacity by 2014
- Summer Peak load of 5,542 MW with Energy Efficiency load reduction in 2024
- Collaborated with IID and modeled IID upgrades based on their 2014 Annual Progress Report

SDG&E Area Assessment Summary

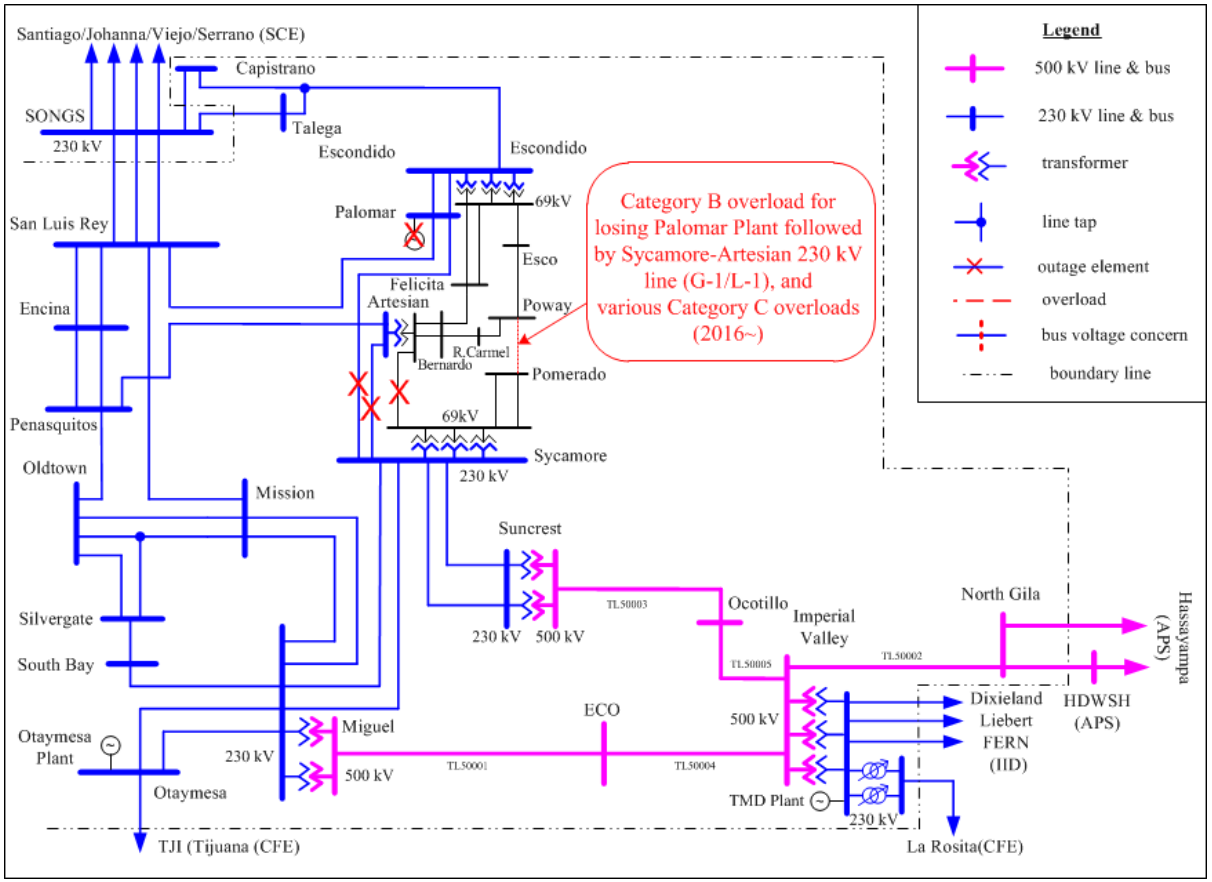
- The assessment identified:
  - 3 branches overloaded for Category B outages
  - 16 branches overloaded for Category C1/C2/C5 outages
  - Various branches overloaded for Category C3 outages
  - 2 power flow diverged for Category C3 outages
  - 1 post-transient voltage instability concerns for C3 outages
- Compared to last year results:
  - A few thermal violations in the 500 transmission system
  - Thermal violations and power flow diverged in the sub-transmission system due to load growth and system configuration changes

SDG&E Area Potential Mitigation Solutions

- 4 Network upgrades to address sub-transmission Category C issues
- Interim solutions prior to the IV PST in-service, including
  - Coordinate with CFE and enable Otay Mesa–Tijuana 230 kV SPS as needed
  - bypass series cap banks on NG-IV 500 kV line
- By the time the IV PST project is in service, ultimate goal is to eliminate or minimize cross tripping the tie with CFE, including
  - bypassing series cap banks on Sunrise and SWPL 500 kV lines
  - swap BK81 position with BK80 in IV 500/230 kV substation
  - three SPS to protect the main 500/230 kV system
  - instant backup or new 500/230 kV bank at Miguel/Suncrest/IV
  - Coordination with CFE on IV PST operation procedure
- Energy Efficiency, DG, Demand Response, and Energy Storage

SDG&E Sub-Transmission 138/69 kV System

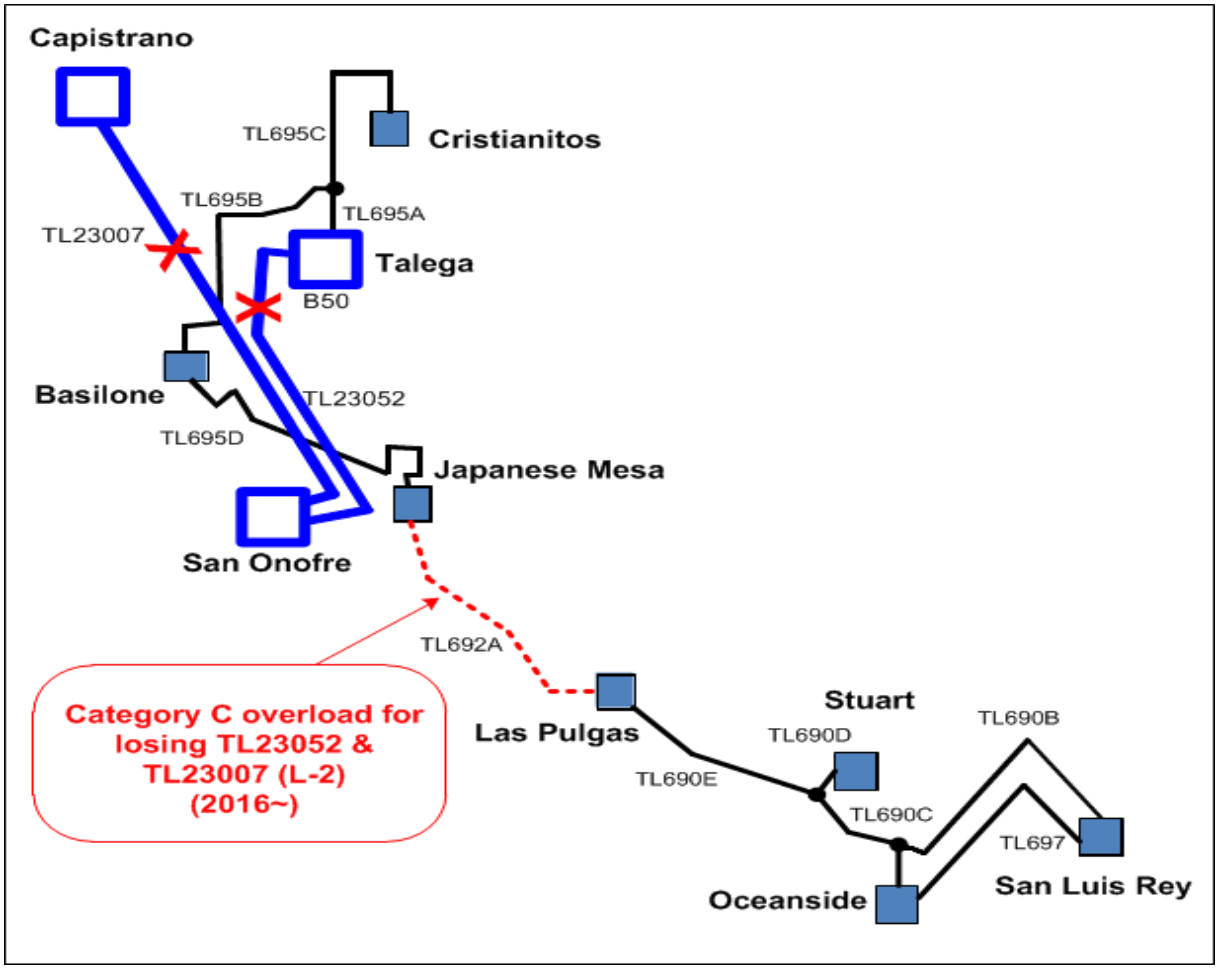
Category C Thermal Violation – (1)



Pomerado-Poway 69 kV T/L

- Thermal Overload
  - TL6913 overload for losing one G-1/L-1 and two N-2 outages (2016~)
  - Re-evaluate if or not the G-1/L-1 is credible Category B event
- Potential Mitigation
  - DG, DR, and Energy Storage
  - Build a 2nd Pomerado-Poway 69 kV line

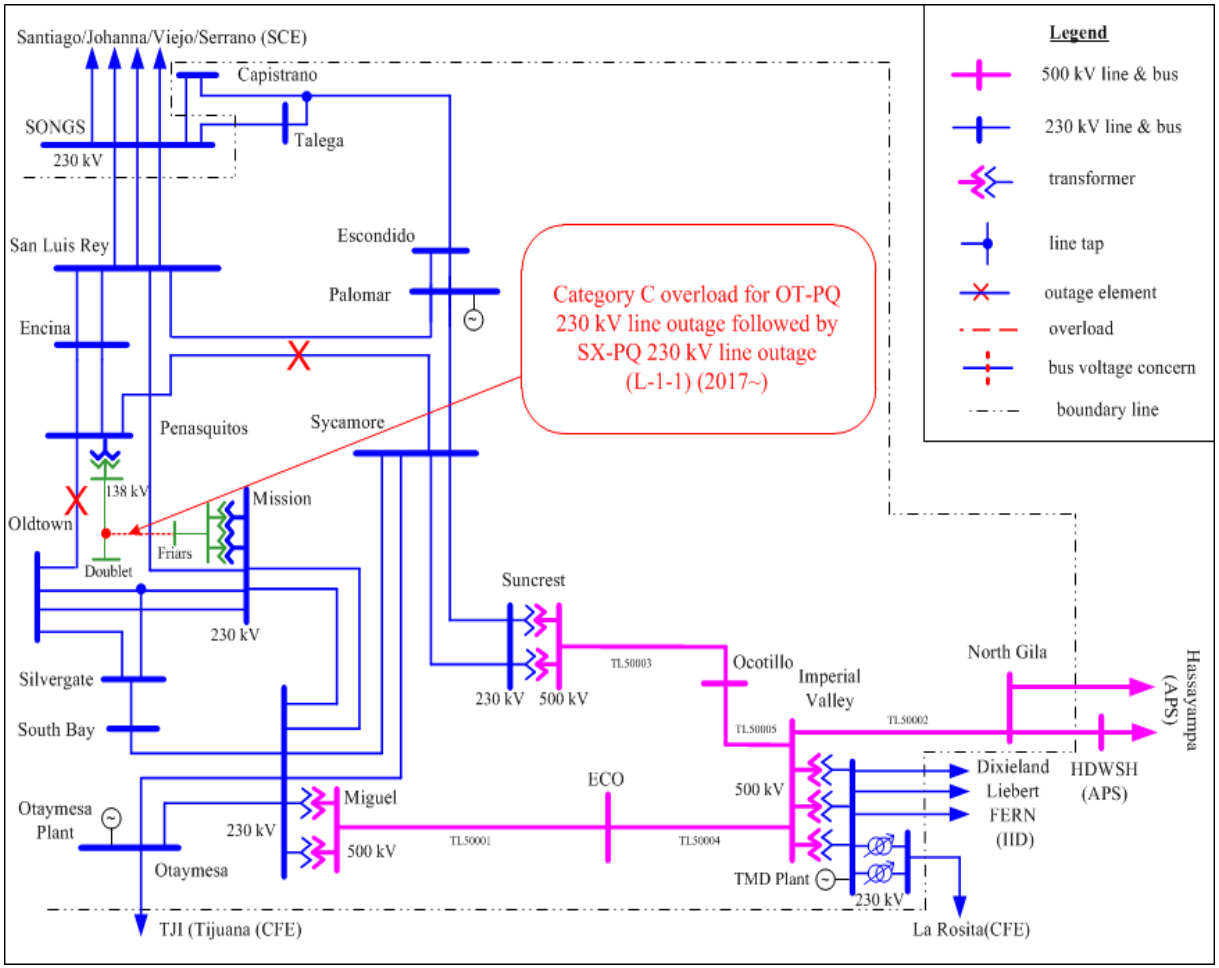
Category C Thermal Violation – (2)



Jap Mesa- Las Pulgas 69kV T/L

- Thermal overload
  - TL692A section overload for N-2 outage of TL23052 and TL23007 (2016~)
- Potential Mitigation
  - Re-conductor TL692A as it is part of the wood-to-steel project
  - Rely on the SPS until the wood-to-steel project implemented on TL692A

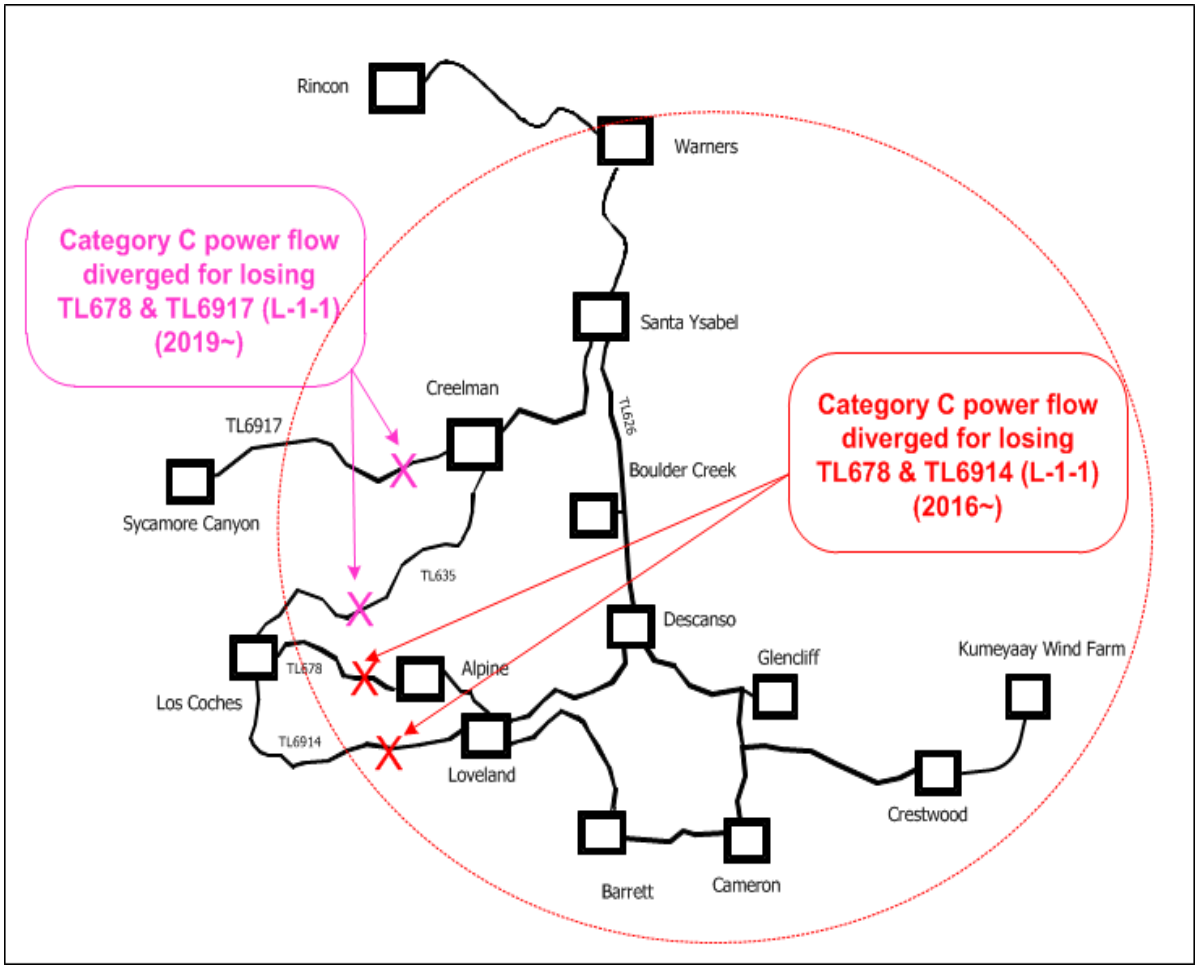
Category C Thermal Violation – (3)



Friars-DoubletTap 138 T/L

- Thermal Overload
  - Friars-DoubletTap 138 T/L overload for losing OldTown-Penasquitos and Sycamore-Penasquitos 230 kV lines (L-1-1) (2017~)
- Potential Mitigation
  - DG, DR, and Energy Storage
  - Build new Mission-Penasquitos 230 kV line by using the abandoned 230 kV line
  - Upgrade Friars-DoubletTap 138 kV line

Category C Power Flow Diverged – (4)

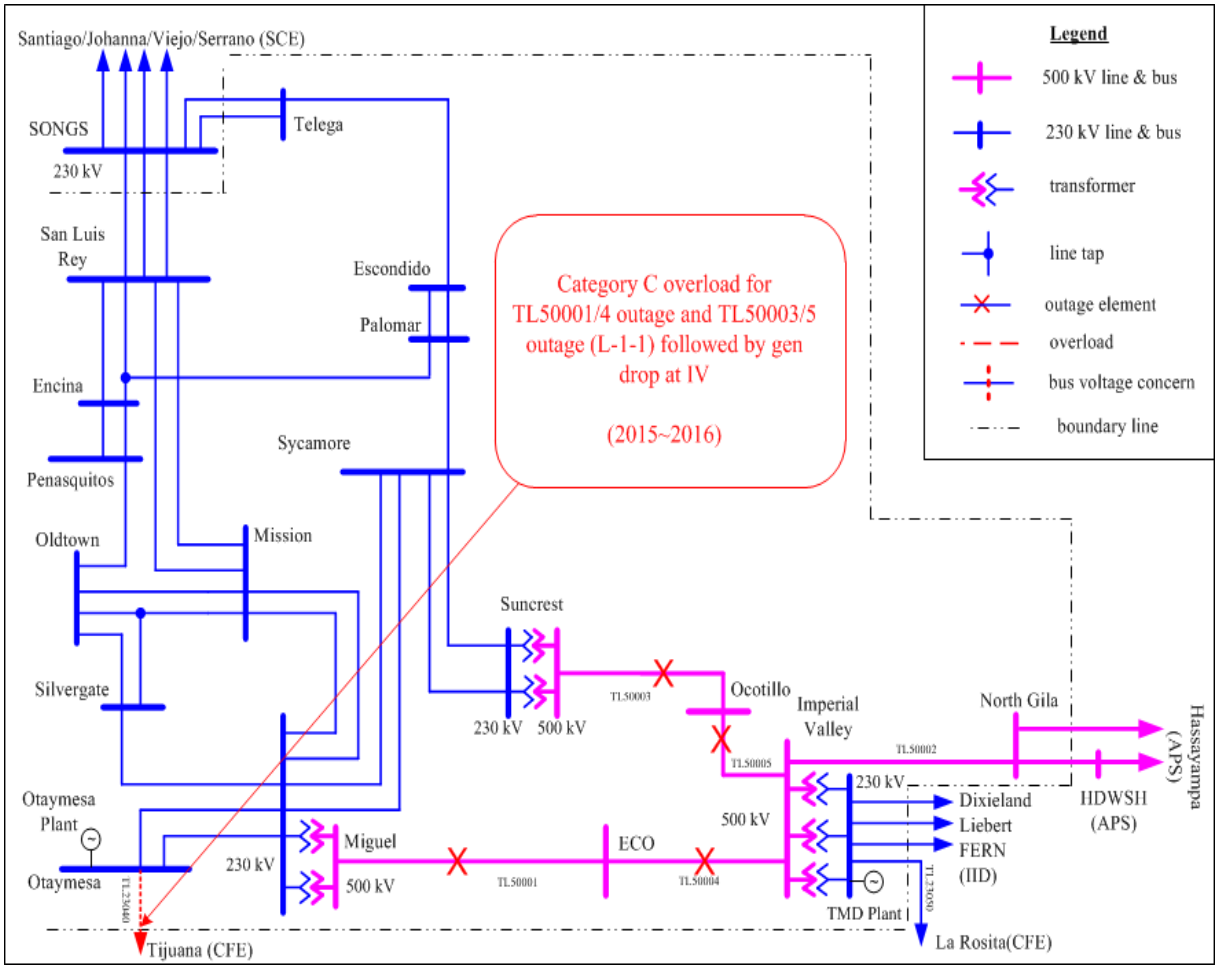


Eastern Back Country 9 kV Area

- Power Flow Diverged in the Eastern back country 69 kV area for
  - Losing TL678 and TL6914 (2015~), and
  - Losing TL635 and TL6917 (2019~)
- Potential Mitigation
  - DG, DR, and Energy Storage
  - New transmission 69 kV source in the area
  - SPS to shed up to 70 MW loads for the 2nd contingency
  - Operation procedure to open TL626

SDG&E Main Transmission 500/230 kV System

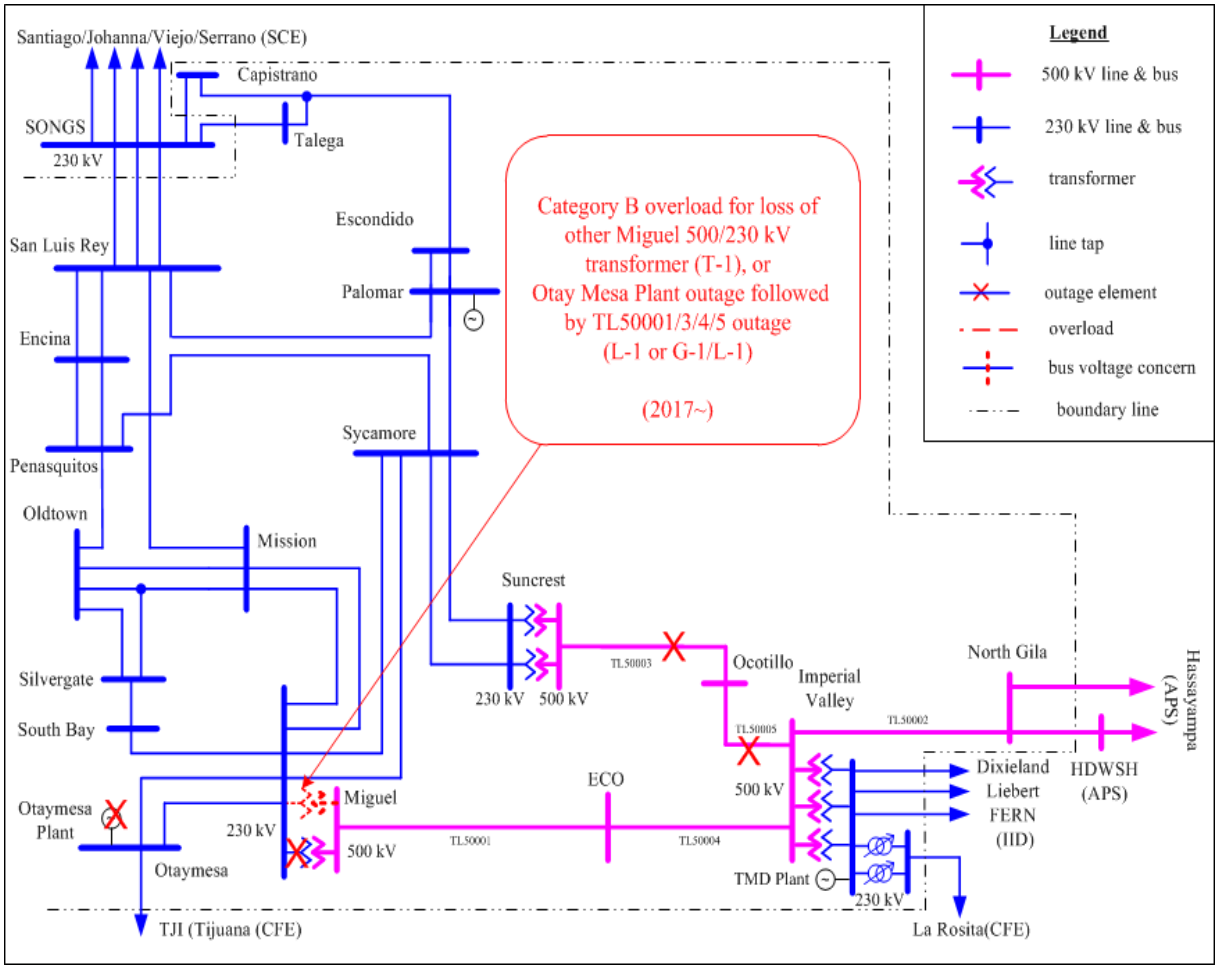
Category C Thermal Violation (Pre-IV PST)



Otay Mesa-Tij 230 kV Tie

- Thermal Overload for various Category C outages (L-1-1) followed by the gen drop at IV prior to IV PST in-service (2015~2016)
- Potential Mitigation
  - By-pass the series cap banks on North Gila-Imperial Valley 500 kV line
  - Coordinate with CFE and enable Otay Mesa–Tijuana 230 kV SPS during summer as needed

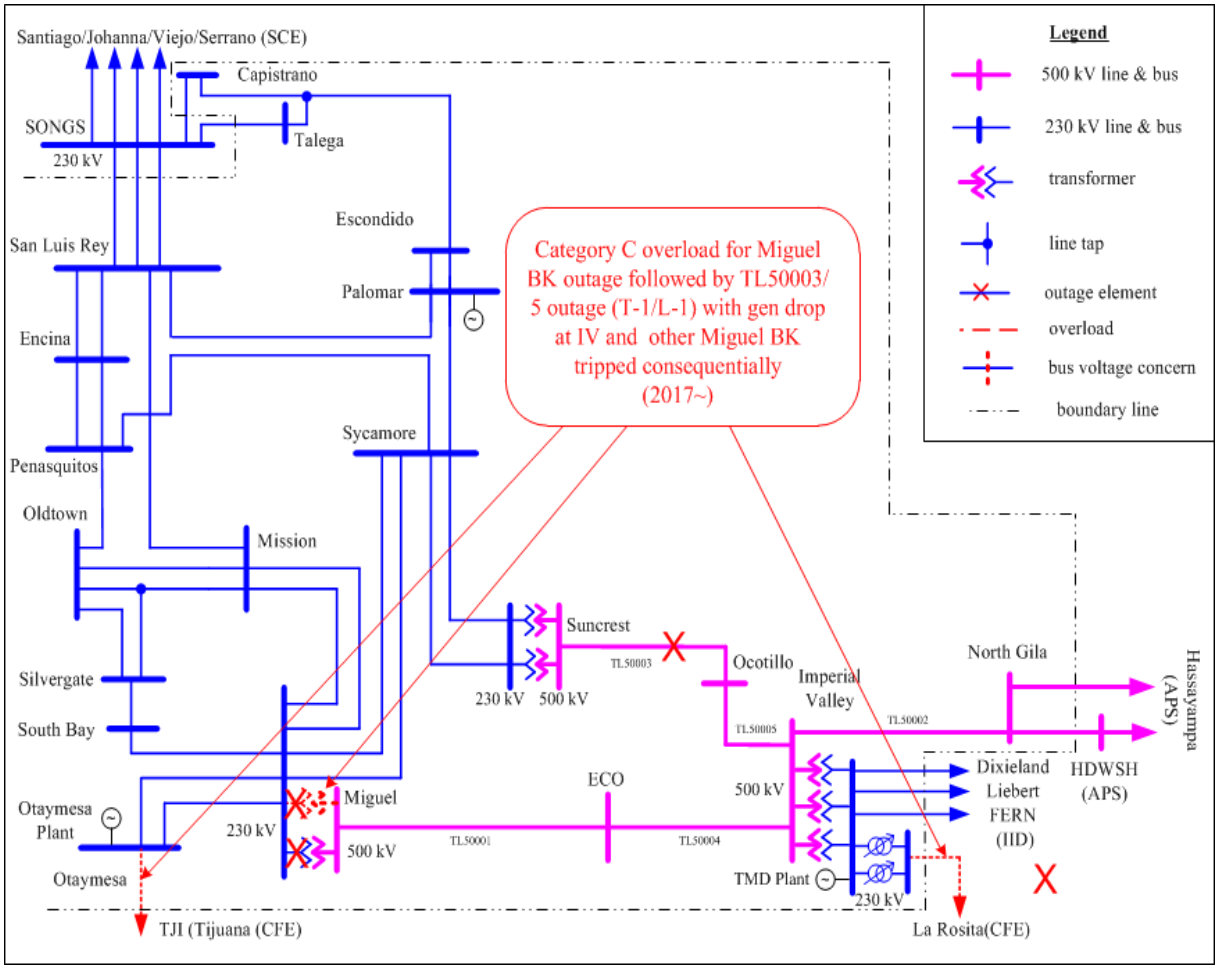
Category B Thermal Violation (Post-IV PST #1)



Miguel 500/230 kV Banks

- Thermal Overload for various Category B (T-1 and G-1/T-1) when the IV PST project is in service (2017~)
- Potential Mitigation
  - DG, DR, and Energy Storage
  - By-pass series cap banks on SWPL 500 kV line
  - Instant backup or new Miguel 3rd 500/230 kV bank

Category C Thermal Violation (Post-IV PST #1 cont'd)

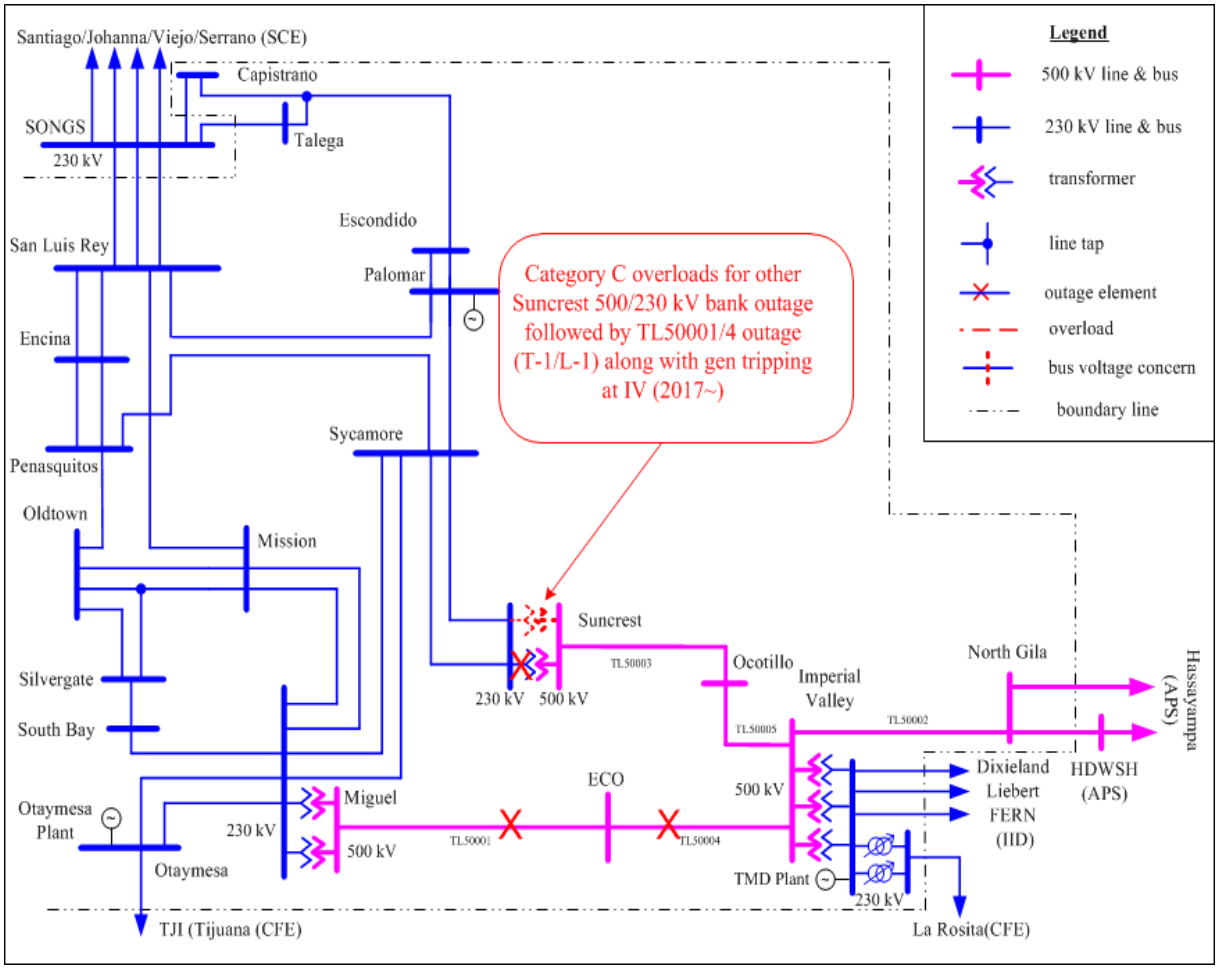


Miguel 500/230 kV Banks (cont'd)

- Thermal Overload for Category C outages (T-1/L-1) (2017~)
- Worst Category C event is Miguel BK80 or BK81 outage followed by TL50003 outage (T-1/L-1)

- Potential Mitigation
  - New SPS to open other Miguel 500/230 kV BK after T-1 outage
  - Instant backup or new Miguel 3rd 500/230 kV bank
  - Operation Procedure on the IV PST

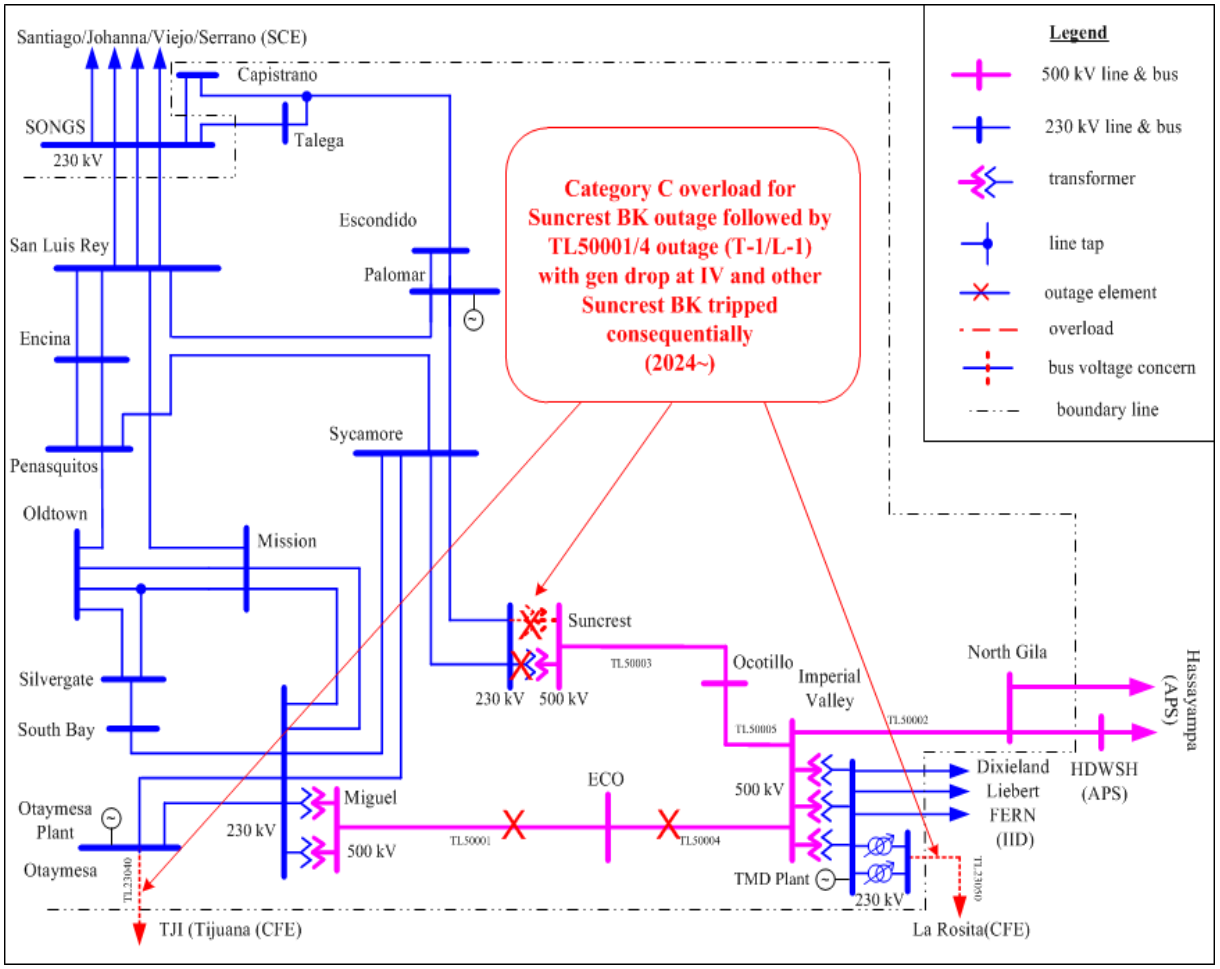
Category C Thermal Violation (Post-IV PST #2)



Suncrest 500/230 Banks

- Thermal Overload for various Category C outages (T-1/L-1) when the IV PST project is in service (2017~)
- Potential Mitigation
  - DG, DR, and Energy Storage
  - By-pass the series cap banks on Sunrise 500 kV line

Category C Thermal Violation (Post-IV PST #2 cont'd)

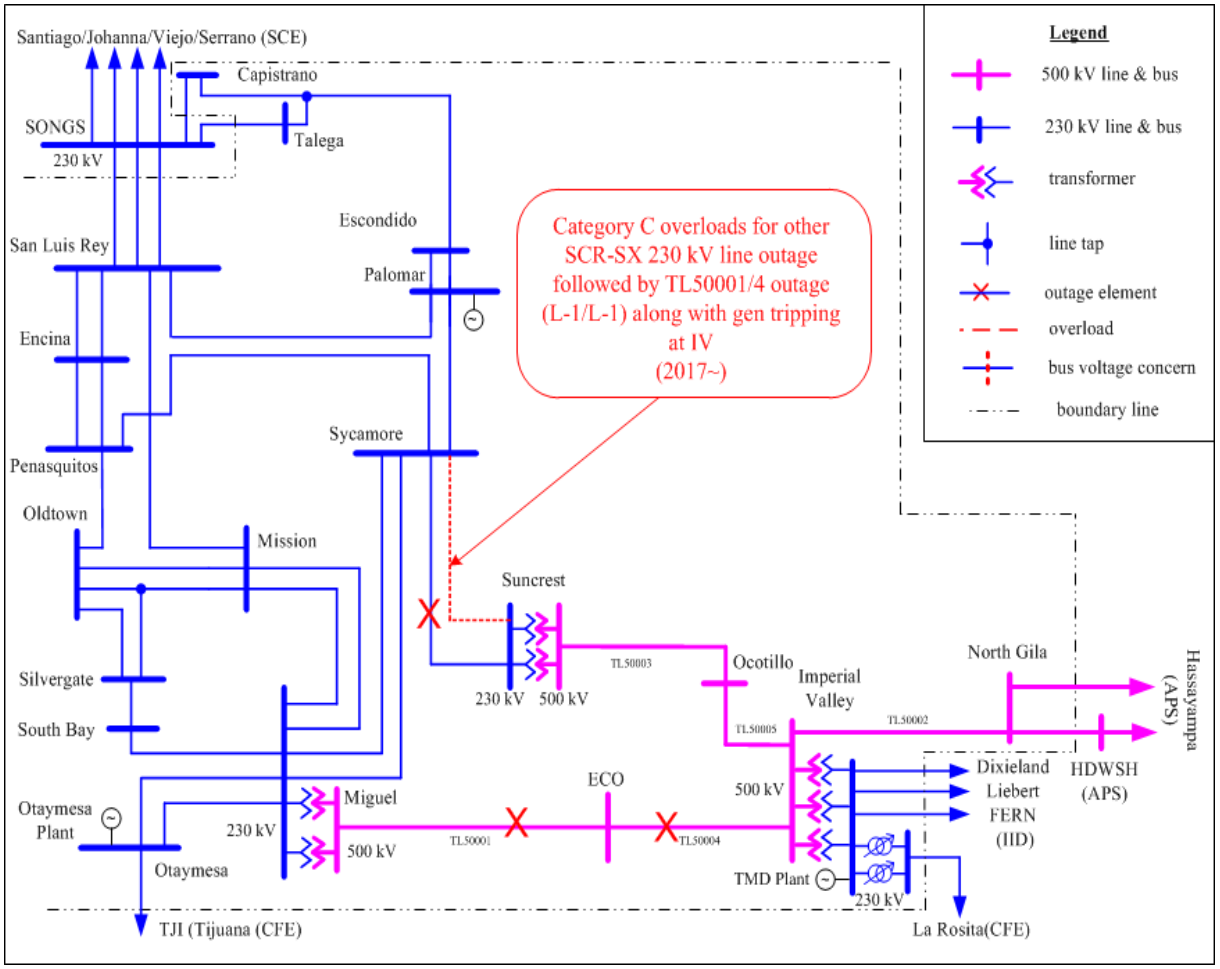


Suncrest 500/230 kV Banks (cont'd)

- Thermal Overload for Category C outages (T-1/L-1) (2024~)
- Worst Category C event is Miguel BK80 or BK81 outage followed by TL50003 outage (T-1/L-1)

- Potential Mitigation
  - New SPS to open other BK after the T-1 outage as needed
  - Operation Procedure on the IV PST
  - Backup 500/230 kV BK

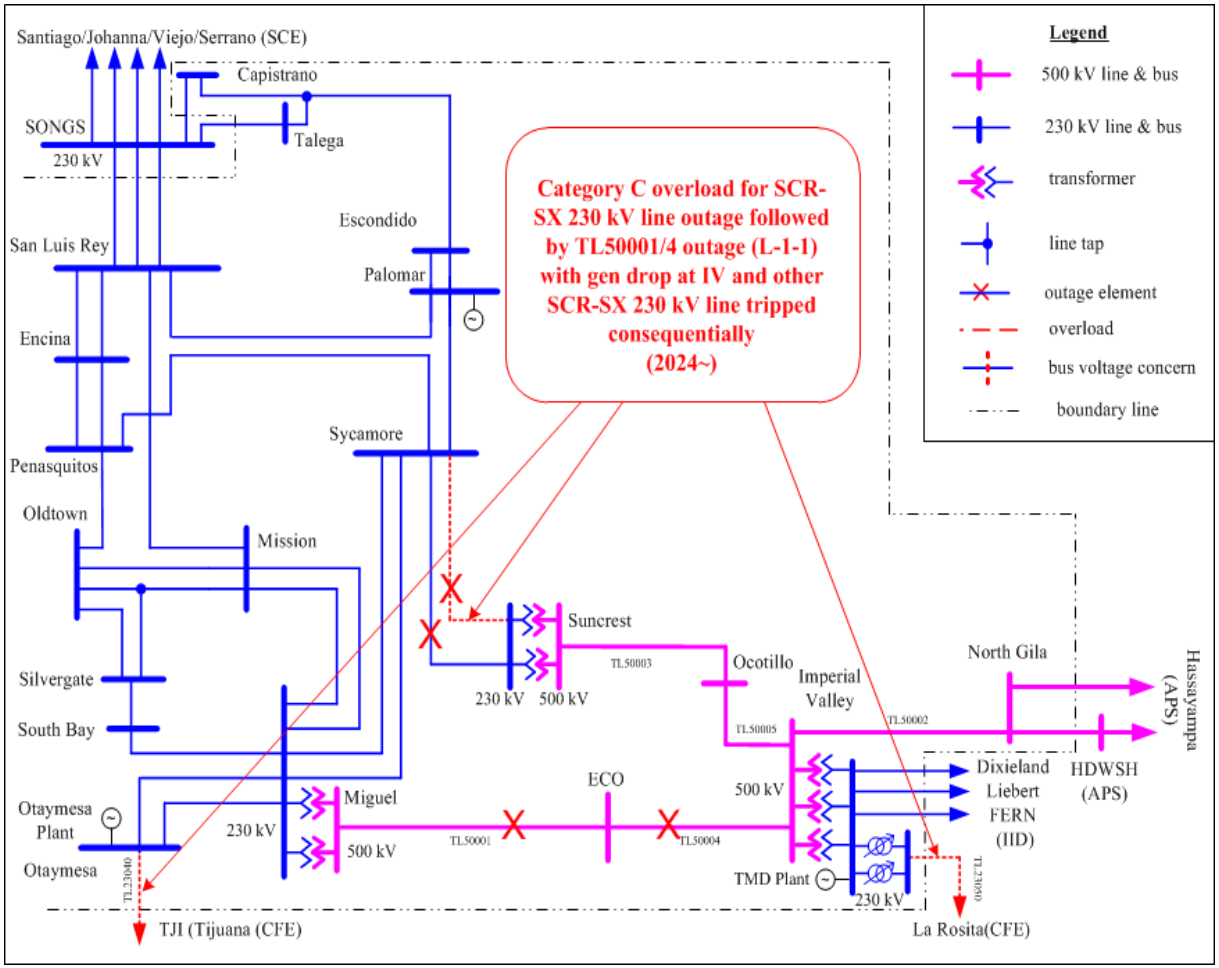
Category C Thermal Violation (Post-IV PST #3)



SCR-SX 230kV T/Ls

- Thermal Overload for various Category B (T-1 and G-1/T-1) when the IV PST project is in service (2017~)
- Potential Mitigation
  - DG, DR, and Energy Storage
  - By-pass series cap banks on Sunrise 500 kV line

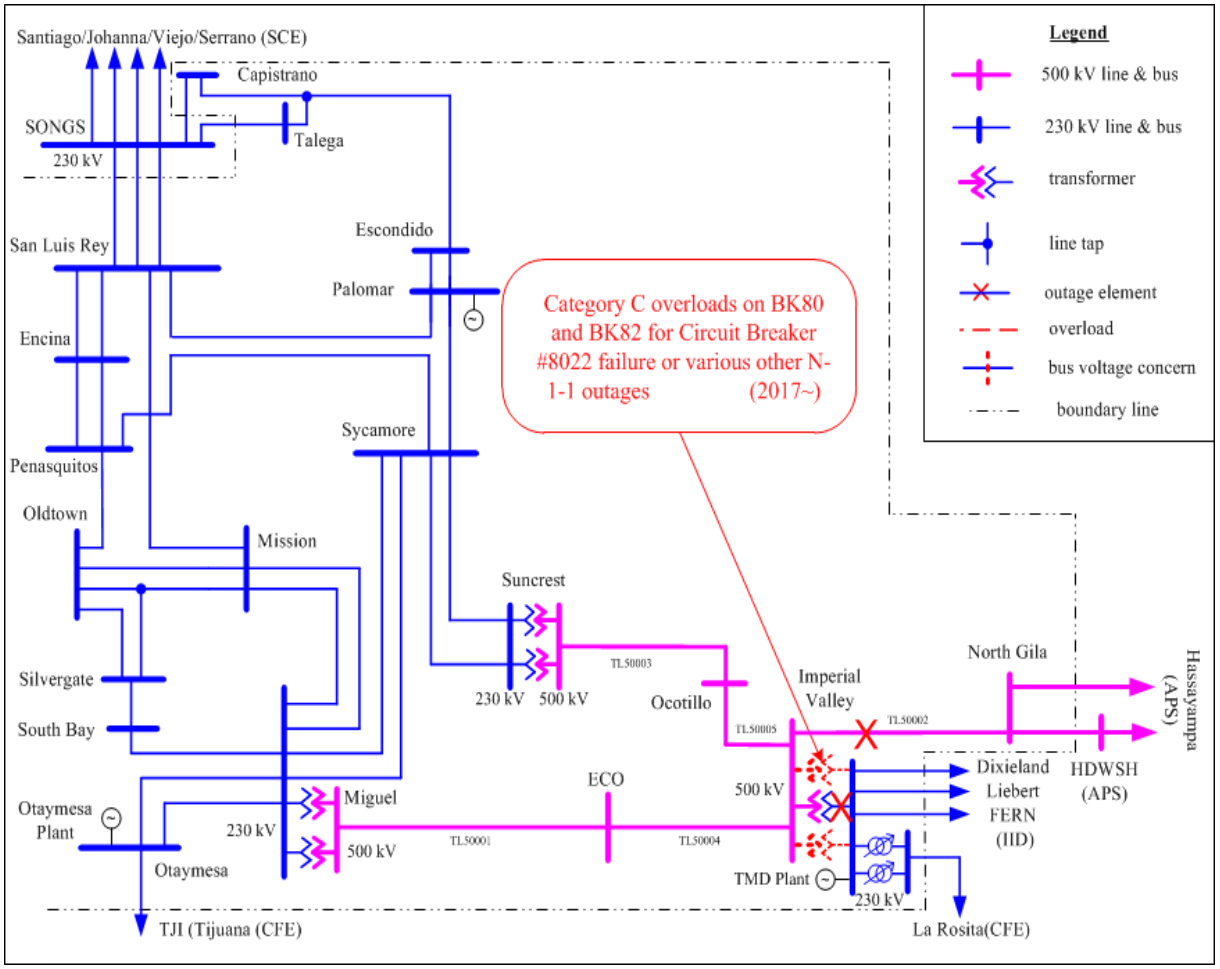
Category C Thermal Violation (Post-IV PST #3 cont'd)



SCR-SX 230kV T/Ls (cont'd)

- Thermal Overload for various Category C outages (L-1-1) (2024)
- Potential Mitigation
  - New SPS to open other SCR-SX 230 kV line after the first outage as needed
  - Operation Procedure on the IV PST

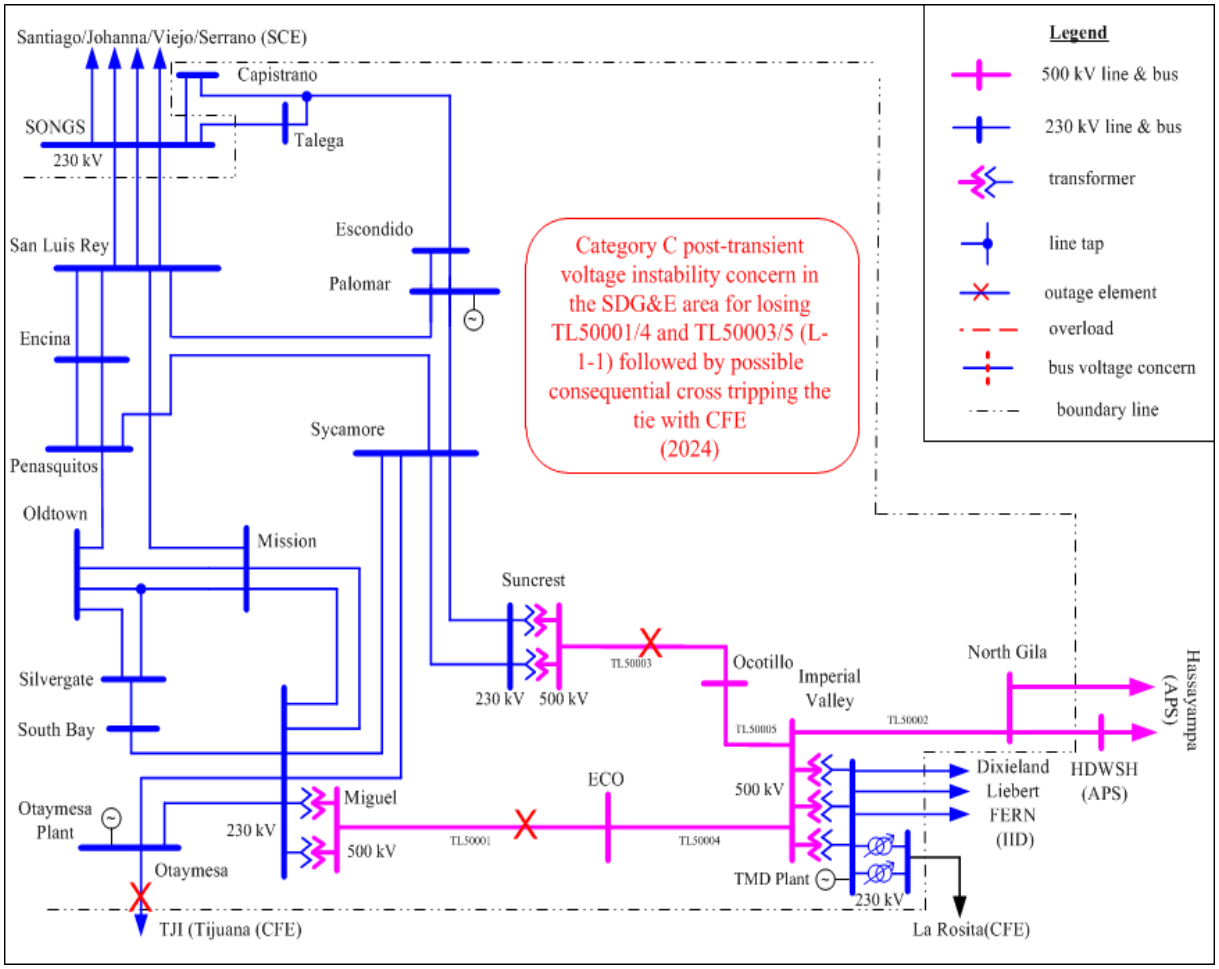
Category C Thermal Violation (Post-IV PST #4)



IV 500/230 kV BK80 & BK82

- Thermal Overload for Category C outages (CB failure and T-1/L-1) (2017~)
- Potential Mitigation
  - Swap BK81 position with BK80
  - Develop higher emergency rating
  - New SPS to drop generation in IV
  - Upgrade aged BK80 in size of 600 MVA to 1120 MVA

Post-Transient Voltage Instability Concern (Post-IV PST #5)



- SDGE Area Post-Transient Voltage Instability Concern for Category C outage (L-1-1) followed by possible consequential cross tripping the tie with CFE (2024)

- Potential Mitigation
  - DG, DR, and Energy Storage
  - System adjustment in SDGE & LA Basin
  - Coordinate with CFE to modify or eliminate the SPS that may cross trip the 230 kV tie

California ISO
Shaping a Renewed Future

Harry Allen-Eldorado 500 kV project evaluation (and development of 2014-2015 simulation model)

Luba Kravchuk
Sr. Regional Transmission Engineer

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Harry Allen-El Dorado 500 kV project evaluation – 2024 base case

- 2024 Base Case:
  - TEPPC 2024 V1.0 (8/1/2014) used as a starting case
    - Added Pacific Corp EIM model
    - Added Nevada Energy EIM model
  - Update load using WECC LRS 2012 and CEC IEPR 2013 Final data
  - CAISO area updates
    - 2014-15 RPS portfolios
    - OTC retirement and replacement
    - CAISO approved transmission projects

Harry Allen-El Dorado 500 kV project evaluation – 2024 base case

- 2024 Base Case:
  - Update natural gas prices using 2013 IEPR final prices
  - Update emission model using 2013 IEPR final GHG prices
  - Update CAISO wheeling rates based on 2014 ISO TAC forecast
  - Updated quick start units in CAISO
  - Updated flexible reserve based on NREL methodology

Harry Allen-El Dorado 500 kV project evaluation – 2019 base case

- 2019 Base Case:
  - 2024 case used as a starting case
  - Update load to 2019 level using WECC LRS 2012 and CEC IEPR 2013 Final data
  - CAISO area updates
    - 2014-15 RPS portfolios – remove generators with in-service dates after 2019
    - OTC retirement and replacement – update to 2019 assumptions
    - CAISO approved transmission projects – remove projects with in-service dates after 2019

Harry Allen-El Dorado 500 kV project evaluation – 2019 base case

- 2019 Base Case:
  - Update natural gas prices to 2019 levels using 2013 IEPR final prices
  - Update emission model to 2019 levels using 2013 IEPR final GHG prices

Study Plan for Import Capacity Benefit Evaluation

- Assess the transfer capability on Path 46 with and without Harry Allen-Eldorado 500 kV line project
- Studies on CAISO's 2014/2015 TPP 2024 summer peak base case with 33% RPS base portfolio
- Assess capacity price differences between desert southwest and California
- Estimate capacity cost benefits based on incremental increase in Path 46 transfer capability and capacity price difference

Next Steps

Kristina Osborne
Stakeholder Engagement and Policy Specialist

2014-2015 Transmission Planning Process Stakeholder Meeting
September 24-25, 2014

Next Steps

Date	Milestone
September 25	PTO presentations on mitigation solutions
September 25-October 9	Stakeholder comments on ISO preliminary reliability results and PTO mitigation solutions to be submitted to regionaltransmission@caiso.com
October 15	Request window closes. Submissions to be submitted to requestwindow@caiso.com
October 30	Post final 2014-2015 reliability study results