

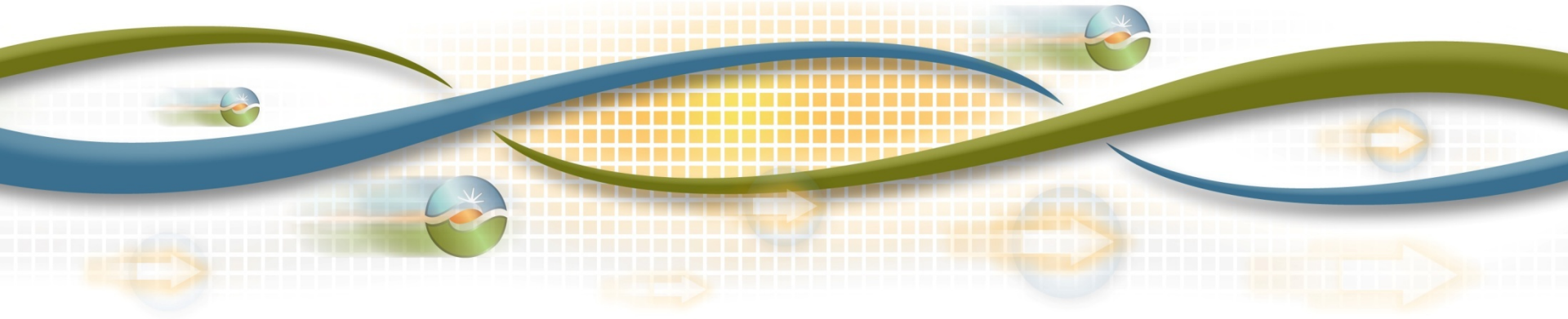
Introduction and Overview

Preliminary Reliability Assessment Results

Neil Millar

Executive Director - Infrastructure Development

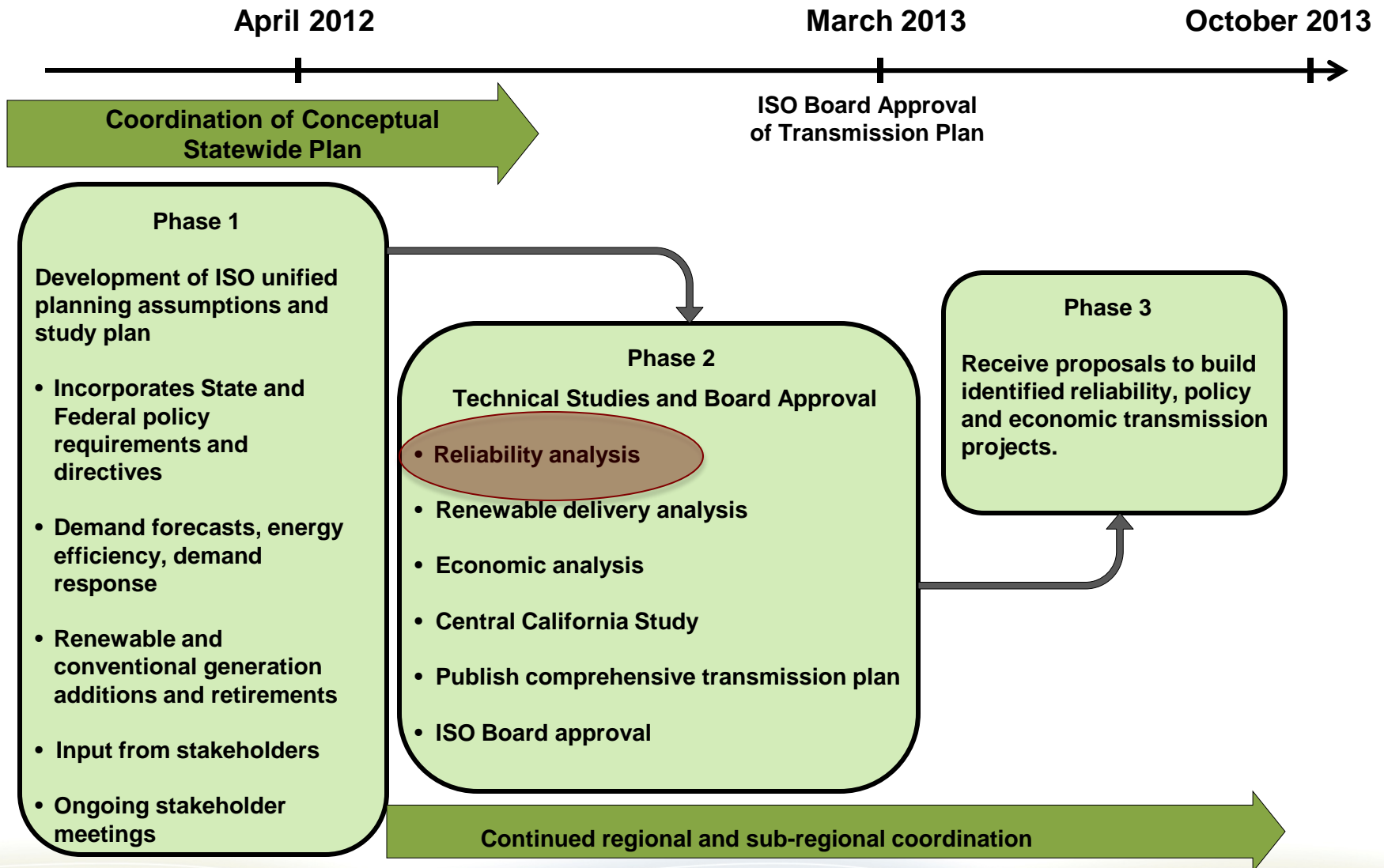
2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



2012-2013 Transmission Planning Process Stakeholder Meeting - Today's Agenda

Topic	Presenter
Introduction	Tom Cuccia - ISO
Overview	Neil Millar - ISO
Preliminary Reliability Results Presentations	ISO Regional Transmission Engineers
Consideration of Non-Transmission Alternatives	Neil Millar - ISO
Wrap-up & Next Steps	Neil Millar

2012/2013 Transmission Planning Cycle



2012/2013 Ten Year Reliability Assessment

- 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
- Transmission request window opened August 15
 - Reliability driven projects

2012/2013 Ten Year Reliability Assessment

- PTO proposed mitigation
 - Submitted to ISO September 14
- Request window
 - Closes October 15
- ISO recommended projects
 - 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

Next Steps

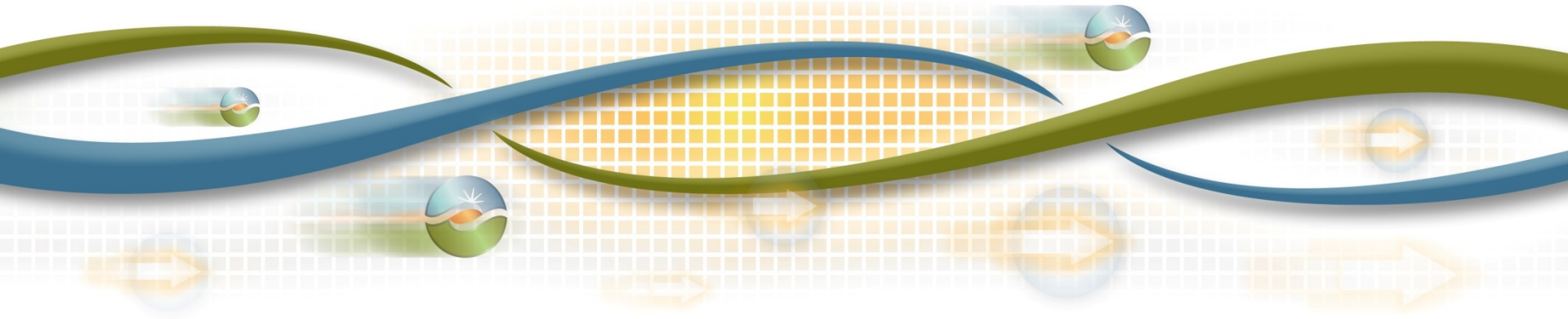
- PTO proposed mitigation
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PG&E Bulk Transmission System Preliminary Reliability Assessment Results

Irina Green

Regional Transmission Engineering Lead

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



PG&E Bulk Transmission System



- From CA-OR border in the north to Vincent 500 kV Sub in the south
- PG&E system is comprised of 60, 115, 230 & 500 kV transmission facilities.
- Cases studied:
 1. 2014 Summer Peak
 2. 2014 Summer Light Load
 3. 2017 Summer Peak
 4. 2017 Summer Off-peak
 5. 2017 Partial Peak
 6. 2022 Summer Peak
 7. 2022 Summer Light Load
- 1-in-5 heat wave load for peak cases

PG&E Bulk System Area Assessment Assumptions

YEARS	2014		2017			2022	
CASES	Summer Peak	Summer Light Load	Summer Peak	Summer Off-peak	Summer Partial Peak	Summer Peak	Summer Light Load
LOAD, MW	28,405	11,332	29,489	14,551	26,590	31,138	12,819
GENERATION, MW	28,624	11,772	29,701	15,751	26,857	29,064	15,149
COI FLOW, MW	4800 (N-S)	1056 (N-S)	4800 (N-S)	2477 (S-N)	4689 (N-S)	4800 (N-S)	354 (S-N)
PATH 26 FLOW, MW	4000 (N-S)	1242 (N-S)	4000 (N-S)	1777 (S-N)	3935 (N-S)	1698 (N-S)	1683 (N-S)
PATH 15 FLOW, MW	1607 (N-S)	64 (S-N)	1699 (N-S)	5176 (S-N)	2574 (N-S)	695 (S-N)	718 (N-S)

- Studies performed: post-transient and transient stability
- Contingencies studied – Category B, C and D: all single and double 500 kV outages, selected 230 kV outages, three phase faults with normal clearing, single-phase-to-ground faults with delayed clearing, stuck breakers, single and double generator outages: Diablo, San Onofre and Paloverde

PG&E Bulk System Assessment Summary

- The post –transient assessment identified:
 - Two Category A overload under partial peak conditions, these lines were also overloaded with all contingencies in partial peak
 - Four Category B overloads under peak load conditions, five Category B overloads under partial peak and one Category B overload under off-peak load conditions
 - Six Category C overloads under peak, three Category C overloads under partial peak and one Category C overload under off-peak load conditions not including facilities overloaded for Categories A and B
 - Voltage deviations to higher voltage in Northwest for bi-pole PDCI outage (Category B) under peak and partial peak load conditions

PG&E Bulk System Assessment Summary

- The dynamic stability assessment identified:
 - Oscillations on Wind Gap irrigational pumps with a three-phase fault at Midway 230 kV
 - Slow frequency recovery on the Wind Gap pumps with a three-phase fault at Midway 230 kV
 - Under-voltage tripping of existing wind generators in the Birds Landing area with a three-phase fault at Contra Costa 230 kV
 - Frequency concerns and under-frequency load tripping at the Gates 115 kV bus with a three-phase fault at Gates 230 kV
 - Helms # 3 unit tripping for under-frequency following a double outage of the Gregg-Herndon 230 kV lines with a three-phase fault under peak load conditions

PG&E Bulk System Assessment Summary

- Compared to last year studies and results:
 - Monitored transmission system at 115 kV and higher voltage levels for the bulk system contingencies
 - Assumed OTC generation retired
 - Updated dynamic stability data for renewable generation, replaced all user-written models with the models from the WECC library

PG&E Bulk System Potential Solutions

- Potential Mitigation Solutions
 - Operating Procedures, SPS, modify existing RAS
 - Congestion Management
 - Possible transmission upgrades
 - Some mitigations are under review

PG&E Bulk System Results Category A Thermal Overloads

- Bellota-Warnerville 230 kV line –2017 summer partial peak
 - Warnerville – Wilson 230 kV line –2017 summer partial peak
- These lines also overload for Categories B and C Contingencies

Mitigation: under review, Central California Study

PG&E Bulk System Results Category B Thermal Overloads

- Cayetano-Lone Tree 230 kV line –2022 summer peak, 2017 partial peak

Mitigation : congestion management, reduce C. Costa generation

- Cottonwood- Olinda (WAPA) #1& #2 230 kV lines –2014 summer peak , 2017 partial peak

Mitigation: WAPA project to upgrade the lines

- Craigview-Weed 115 kV line – all peak and partial peak cases

Mitigation: under review, change Weed phase shifter settings

- Delta-Cascade 115 kV line – 2017 partial peak (Category C during peak)

Mitigation: under review, change Weed phase shifter settings

- Gates-Midway 230 kV line – 2017 off-peak case

Mitigation: trip one Helms pump for the Gates-Midway 500 kV outage, trip renewable generation at Midway and all Helms pumps for Category C

PG&E Bulk System Results Category C Thermal Overloads

- Table Mountain 500/230 kV transformer – 2022 summer peak

Mitigation : modify RAS for 500kV double outage south of Table Mtn or upgrade

- Contra Costa-Delta switchyard 230 kV line – 2014 summer peak

Mitigation : upgrade modeled from 2017, reduce C. Cos gen prior to upgrade

- Tesla-Delta switchyard 230 kV line – 2017 summer partial peak

Mitigation : reduce C. Cos Sub and/or Gateway generation

- C. Costa-C. Costa Sub 230 kV line – 2014 summer peak, 2017 partial peak

Mitigation: re-rate or reconductor, or reduce C. Cos generation

- Westley-Los Banos 230 kV line – 2017 off-peak

Mitigation: under review, Central California Study

- Ashlan-Gregg and Ashlan-Herndon 230 kV lines – 2014 and 2017 peak

Mitigation: upgrade modeled in 2022, trip 3rd Helms gen and/or load at Ashlan for Gregg-Herndon 230 kV double outage prior to upgrade

- Midway-Kern # 1 230 kV line – 2022 peak, 2017 peak and partial peak

Mitigation: trip load in Bakersfield with Midway-Kern #3 and # 4 outage

PG&E Bulk System Results – North, Thermal Overloads

- Cragview-Weed 115 kV – Category B and C (peak, from 2014)
- Delta-Cascade 115 kV Category B (partial peak 2017) and C (peak from 2014)

Potential Mitigation

- Change Weed Phase shifter settings
- Cottonwd-Olinda 230 kV #1 and #2 – Category B (2014 peak, 2017 partial peak)

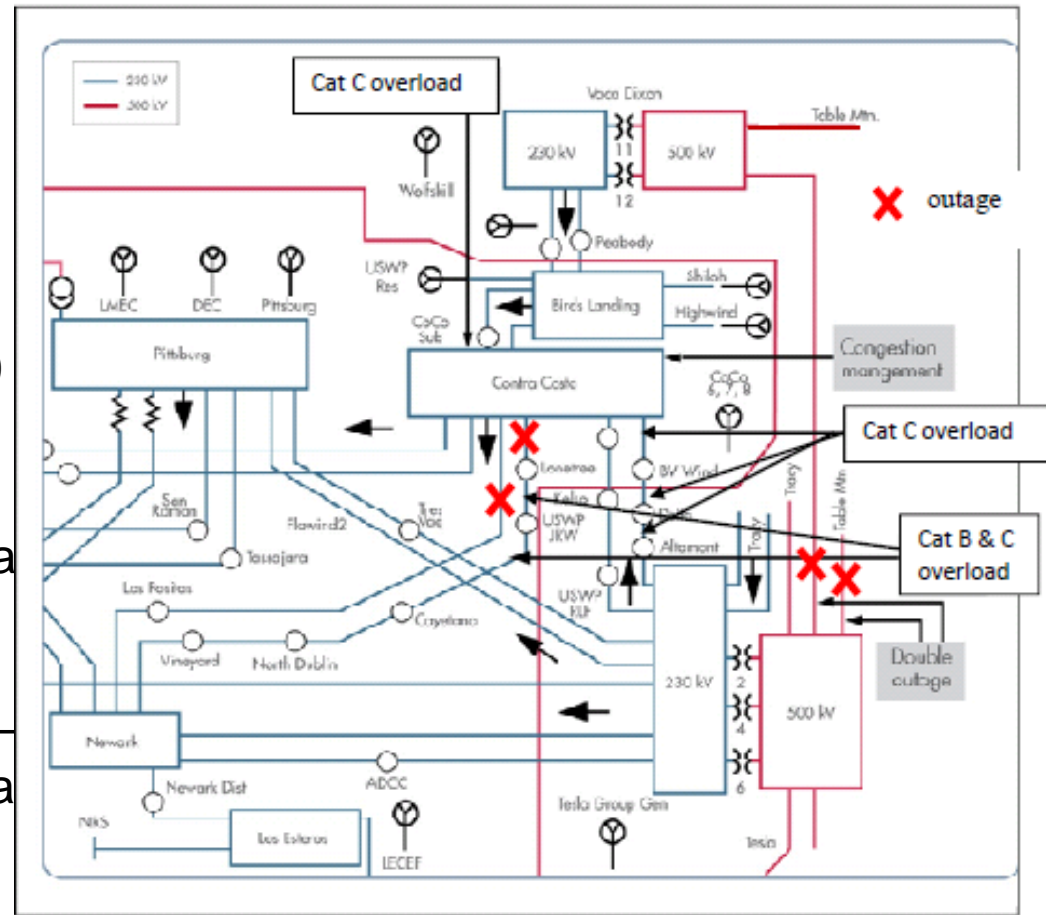
Potential Mitigation

- WAPA project to upgrade
- Table Mtn 500/230 kV bank – Category C (2022 peak)
- Modify RAS or upgrade



PG&E Bulk System Results – SF Bay Area, Thermal Overloads

- Cayetano-Lone Tree 230 kV – Category B and C (peak 2022, partial peak 2017)
Potential Mitigation
- Reduce C. Costa generation
- Contra Costa-Delta Switchyard 230 kV– Category C (2014 peak)
Potential Mitigation
- Project to upgrade, reduce C. Costa generation prior to the project
- Contra Costa-C. Costa Sub 230 kV– Category C (2014 peak, 2017 partial peak)
Potential Mitigation
- Re-rate, reconductor or reduce C. Costa generation



Tesla-Delta Switchyard 230 kV – Category C (2017 Partial peak)
Potential Mitigation – reduce Gateway generation

PG&E Bulk System Results – Central California Thermal Overloads

- Bellota-Warnerville 230 kV and Warnerville-Wilson 230 kV Category A, B & C (2017 partial peak) Potential Mitigation

- Under review, Central Cal. Study

- Gates-Midway 230 kV Category B & C (2017 off-peak) Potential Mitigation

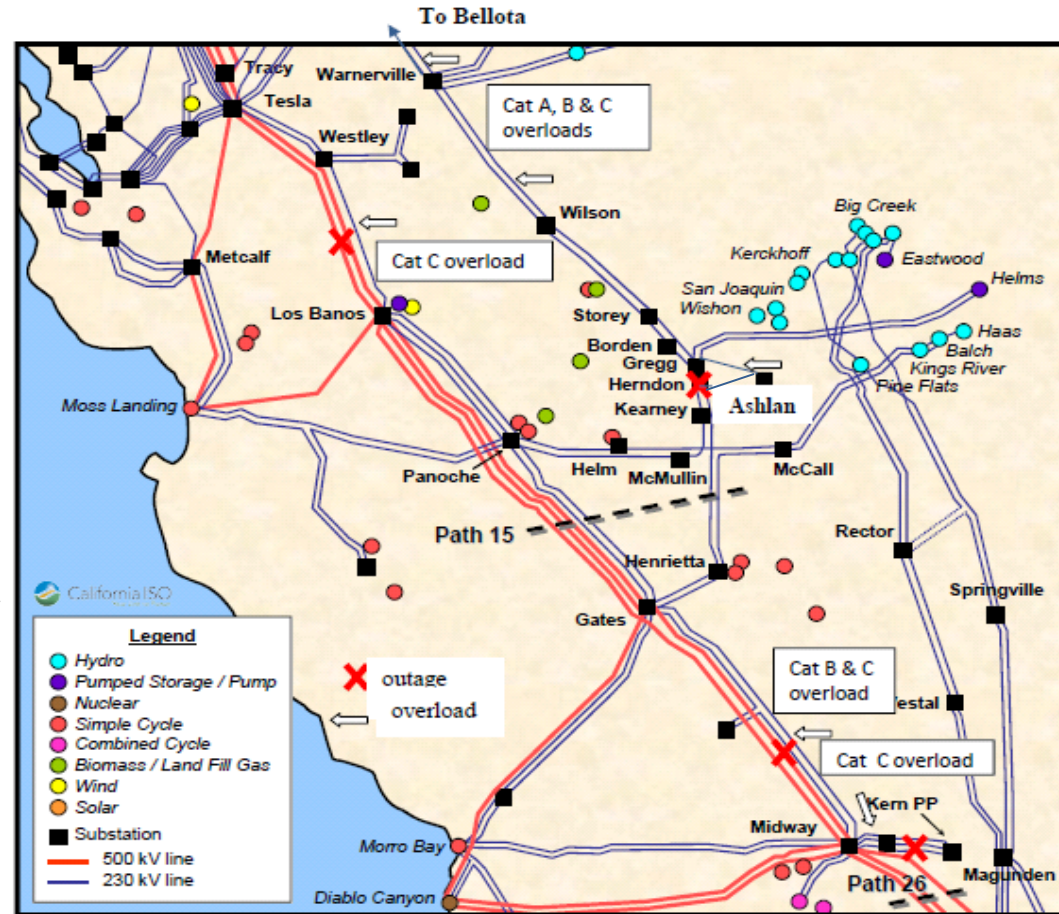
- Trip 1 Helms pump for Cat B, modify RAS for Cat C

- Westley-Los Banos 230 kV line – Category C (2017 off-peak)

Potential Mitigation

- Under review, Central Cal. Study

- Ashlan-Gregg and Ashlan-Herndon 230 kV lines – Category C (2014-17 peak)



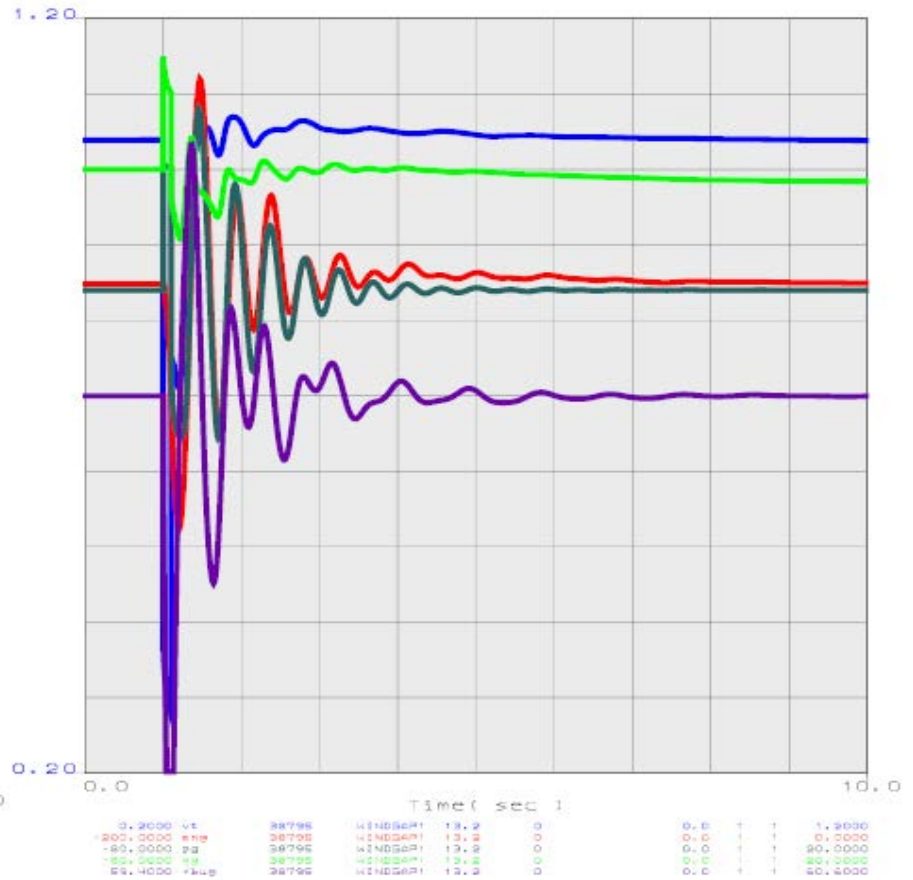
Potential Mitigation – upgrade

- Midway-Kern # 1 230 kV line – Category C (2017-22 peak)

Potential Mitigation – trip load

PG&E Bulk System Results – Dynamic Stability

3-phase fault at Midway 230 KV, Midway-Gates230 kV outage. Wind Gap pumps plots



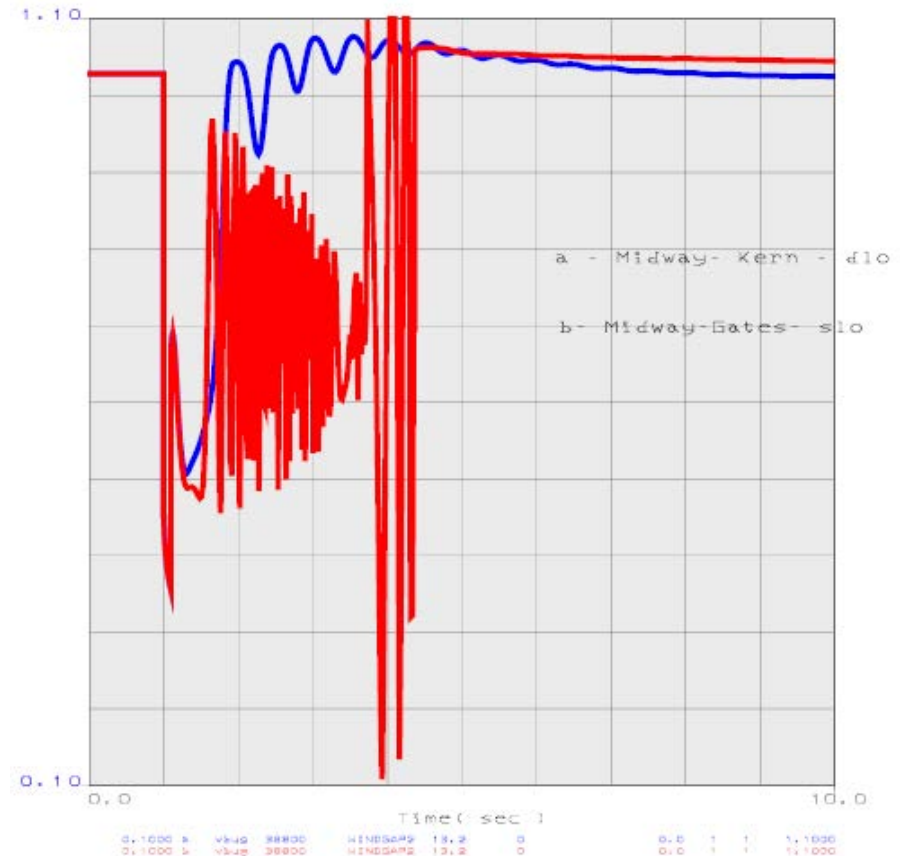
2022 peak, no SPS

2022 peak, Wind Gap # 2 tripped

PG&E Bulk System Results – Dynamic Stability

2017 peak case. 3-phase fault at Midway 230 KV

- Voltage at Wind Gap 2
- Blue – Midway-Kern 230 kV outage
- Red- Midway-Gates 230 kV outage
- Delayed voltage recovery with Midway-Gates outage, oscillations on Wind Gap pumps
- Large voltage and frequency dip on 70 kV Wheeler Ridge system with Wind Gap pumps tripped



PG&E Bulk System Results – Dynamic Stability

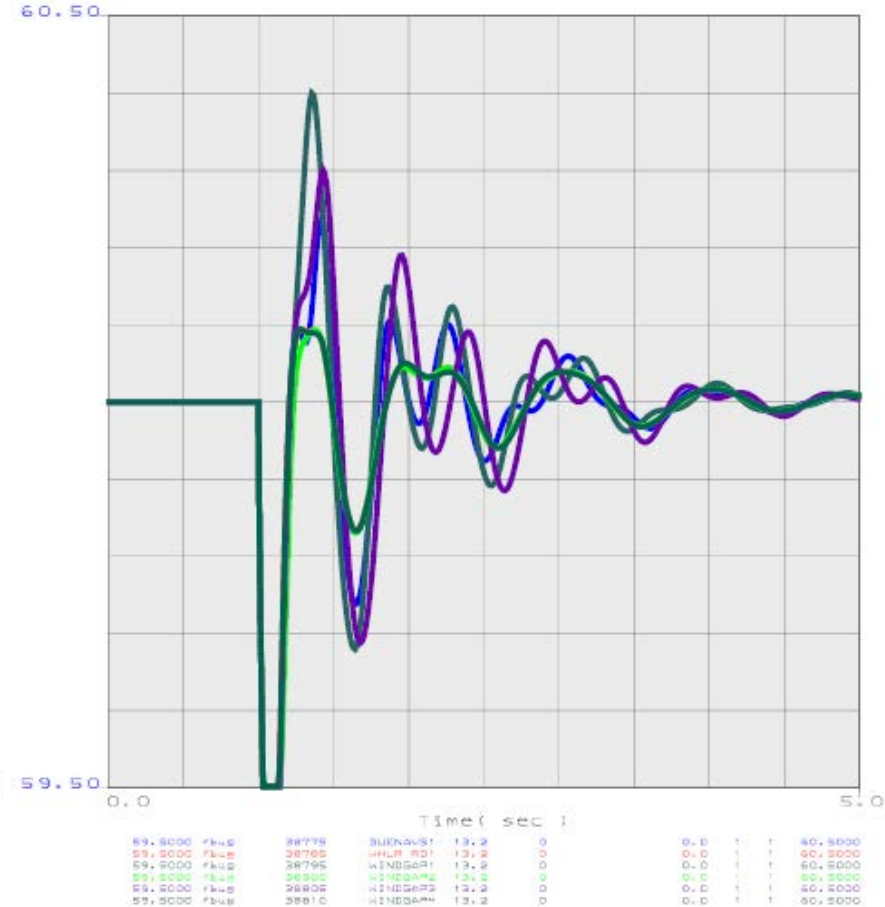
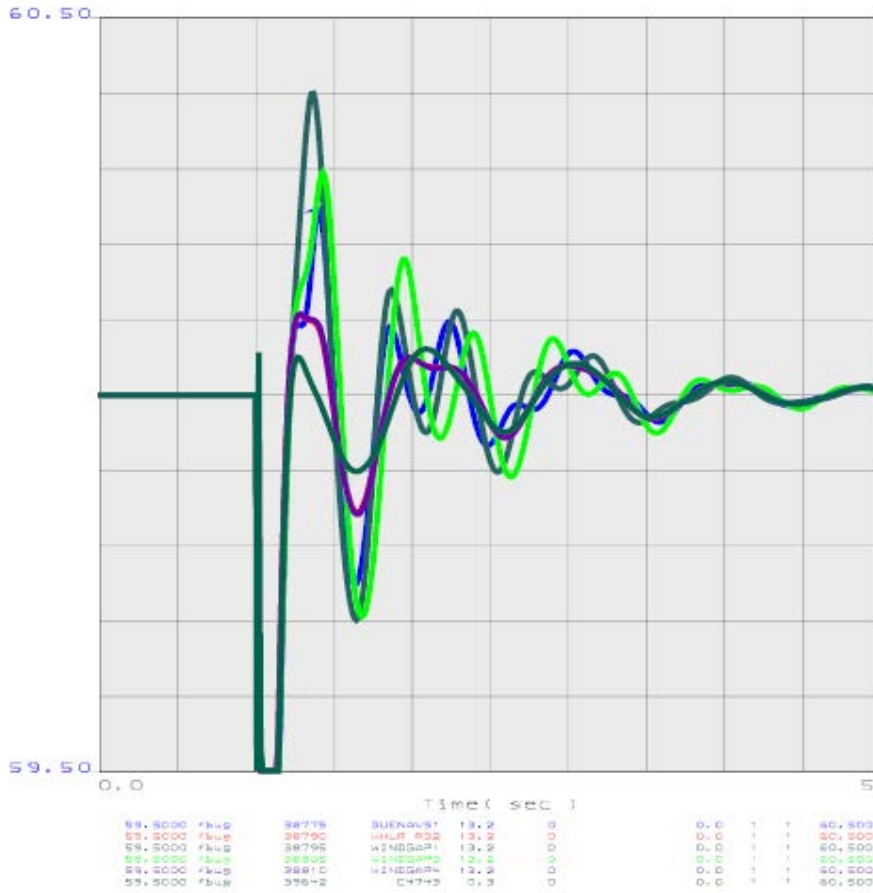
3-phase fault at Midway 230 KV, Midway-Gates 230 kV outage. Voltage plots

- Wind Gap 2 pumps tripped
- Voltage dip over 25%



PG&E Bulk System Results – Dynamic Stability

3-phase fault at Midway 230 KV, Midway-Gates230 kV outage. Slow frequency recovery

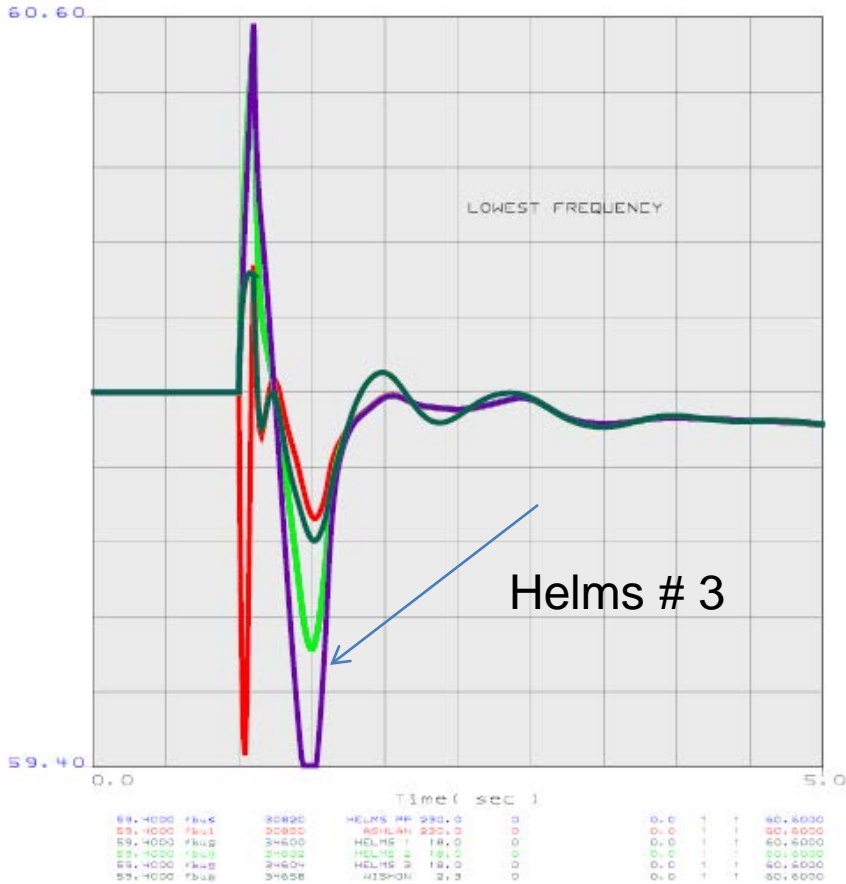


2022 peak, Wind Gap # 2 tripped

2022 peak, no solar PV at Midway,
Wind Gap # 2 tripped

PG&E Bulk System Results – Dynamic Stability.

Summer peak 2022. 3-phase fault at Gregg 230 KV, Gregg-Herndon 230 kV double outage



2 Helms units tripped by SPS, Helms 3 tripped by under-frequency relay

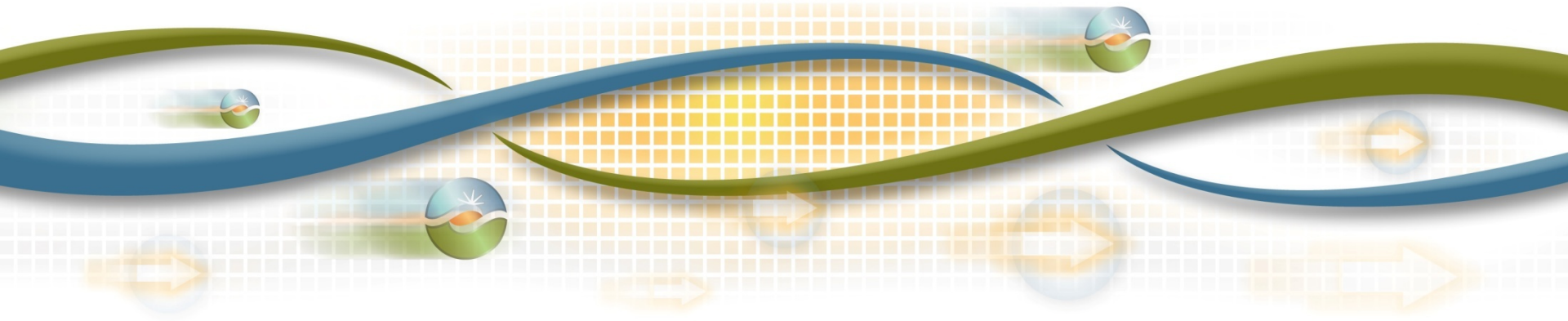
3 Helms units tripped by SPS

Questions? Comments?

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

Rajeev Annaluru
Senior Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



Humboldt Area



- 3000 sq. miles. NW corner of PG&E
- Cities: Eureka, Arcata, Garberville
- Generation - Humboldt Bay Power Plant , renewable and QFs, total 258 MW
- Voltage 115 kV – from Cottonwood, 60 kV – from Mendocino
- Winter peak 211 MW in 2022, summer peak 184 MW in 2022

Humboldt Area Assessment Summary

- The assessment identified:
 - Thermal overloads due to Category B – 1 and Category C - 9
 - Low voltage due to Category B – 13 and Category C – 16
 - Voltage deviations due to Category B – 11 and Category C - 3
- Compared to last year results:
 - Load forecast in 2022 reduced as compared to last years 2021 forecast
 - All the major issues identified in this years analysis are similar to the issues identified last year.

Humboldt Area Potential Solutions

- Potential Mitigation Solutions
 - PG&E Operating Procedures (such as load transfers and adjusting generation from Humboldt Bay) for Category B and C
 - Interim operating solutions until previously approved projects get implemented.

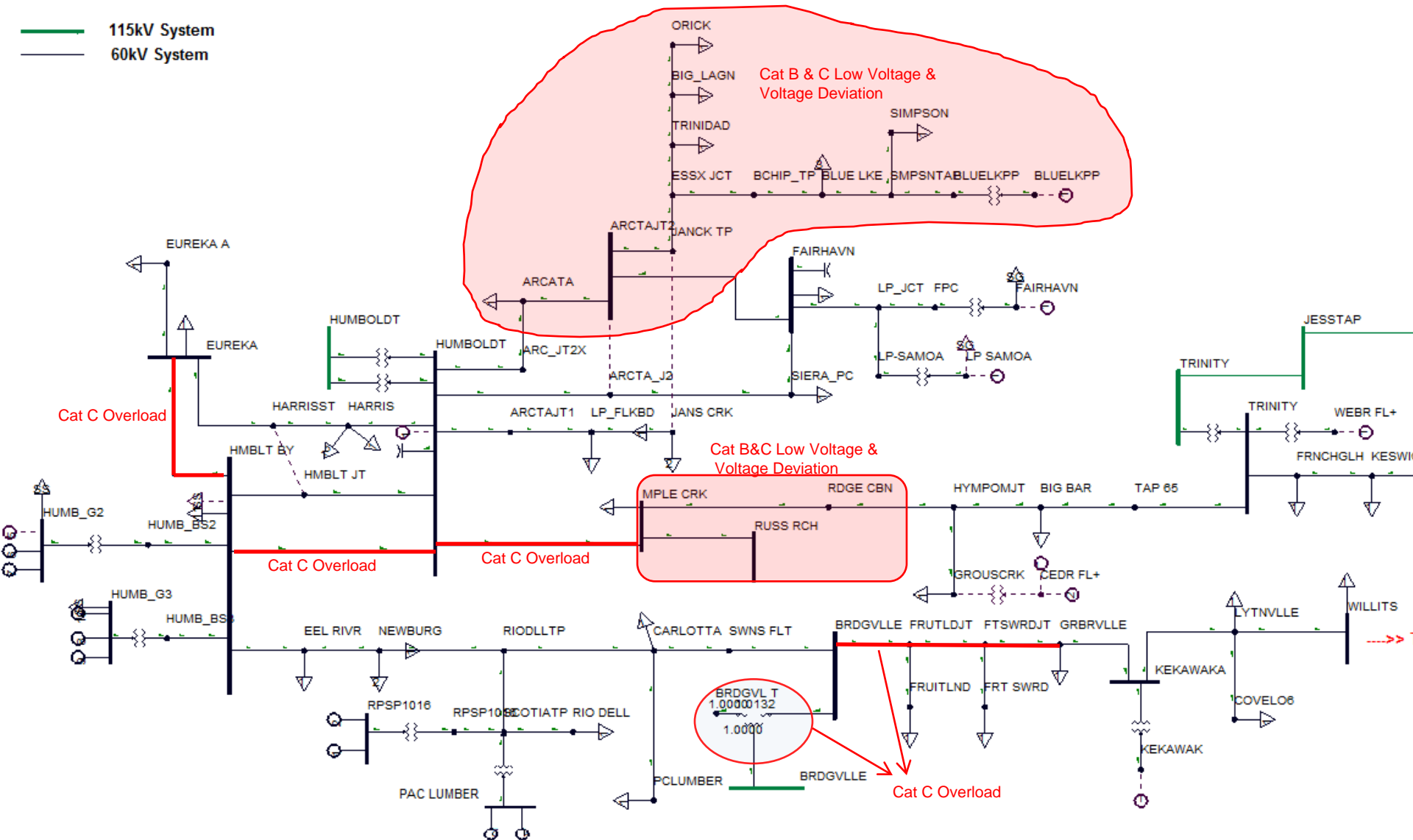
Humboldt Area – Results (Category A & B)

- Thermal Overloads
 - Humboldt Bay – Humboldt 60kV line #1 (Cat B)
 - Mitigation - Reconductor the line
- Low Voltage
 - Russ Ranch 60kV, Willow Creek 60kV, Hoopa 60kV
 - Mitigation – Maple Creek reactive support project.
- Voltage Deviation
 - Ridge Cabin 60kV, Maple Creek 60kV, Russ Ranch 60kV, Willow Creek 60kV, Hoopa 60kV (Cat B)
 - Maple Creek reactive support project
 - Orick 60kV, Big Lagoon 60kV, Trinidad 60kV, Essex 60kV, Arcata 60kV (Cat B)
 - Mitigation – Adjust generation at Blue Lake, Fair haven

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

Humboldt Area – Results (cont'd)

— 115kV System
— 60kV System



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 1739 MW in 2022

North Coast / North Bay Area Assessment Summary

- The assessment identified:
 - Thermal overloads due to Category A - 1
 - Thermal overloads due to Category B – 7 and Category C - 39
 - Low voltages due to Category B – 4 and Category C - 45
 - Voltage deviations due to Category B - 27 and Category C - 12
- Compared to last year results:
 - Load forecast in 2022 reduced as compared to last years 2021 forecast
 - All the major issues identified in this years analysis are similar to the issues identified last year.

North Coast / North Bay Area Potential Solutions

- Potential Mitigation Solutions
 - PG&E Operating Procedures (such as load transfers and adjusting generation from Humboldt Bay) for Category B and C
 - Interim operating solutions until previously approved projects get implemented.
 - Install series breaker to mitigate stuck breaker issues
 - Install reactive support to mitigate voltage issues

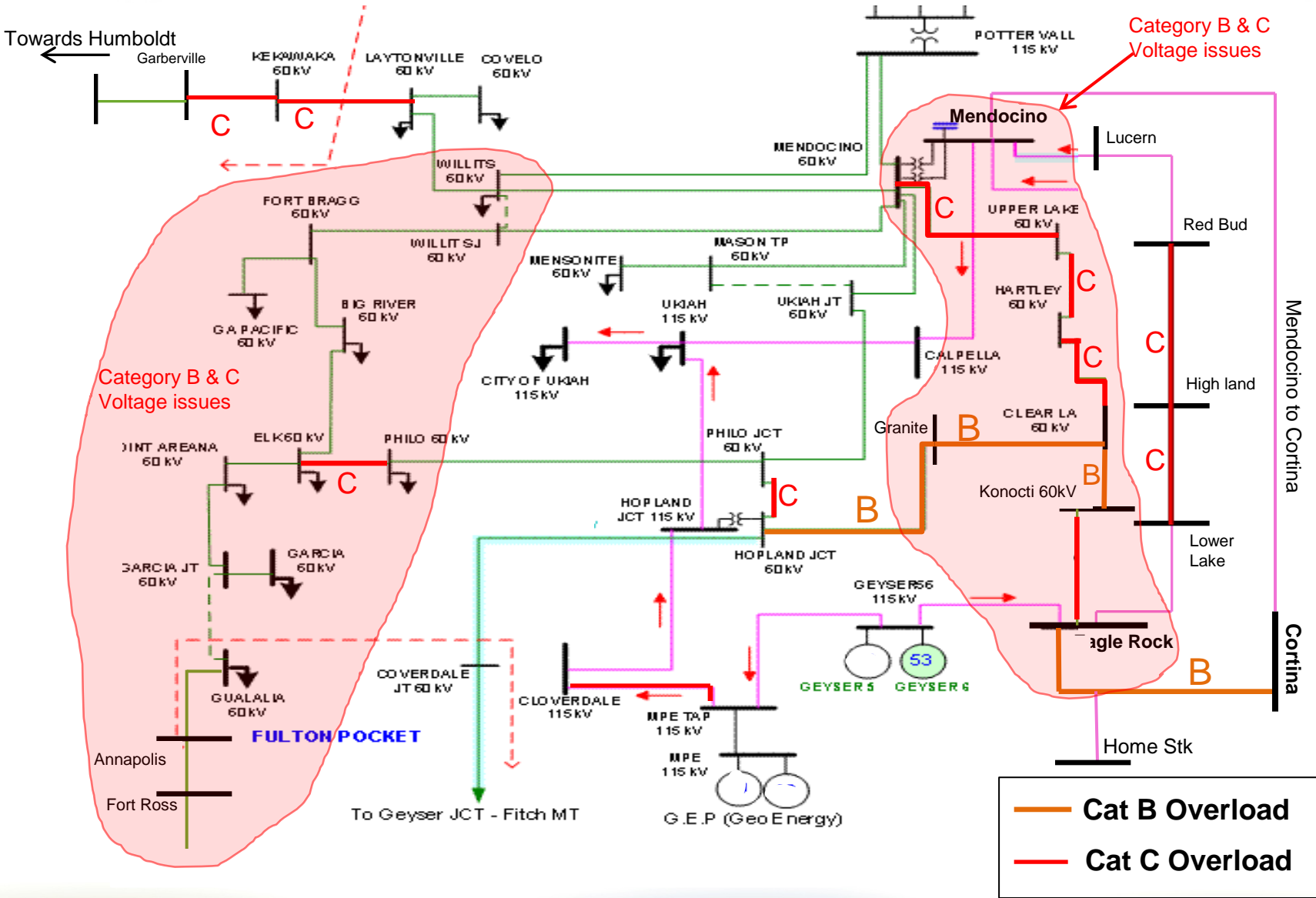
North Coast / North Bay Area – Results (Category A & B)

- Thermal Overloads
 - Bridgeville – Garberville 60kV line #1 (Cat A)
 - Mitigation – new Bridgeville – Garberville 115kV line
 - Clear Lake – Hopland 60kV line (Cat B)
 - Mitigation – Middletown 115kV project
 - Mendocino – Clear Lake 60kV line (Cat B)
 - Mitigation – Middletown 115kV project
 - Clear Lake – Eagle Rock 60kV line #1 (Cat B)
 - Mitigation – PG&E Operating procedure
 - Monte Rio – Fulton 60kV line (Cat B)
 - Mitigation – PG&E Operating procedure
 - Elk – Philo 60kV line (Cat B)
 - Mitigation – PG&E Operating procedure
 - Eagle Rock – Cortina 115kV line (Cat B)
 - Mitigation – Adjust generation

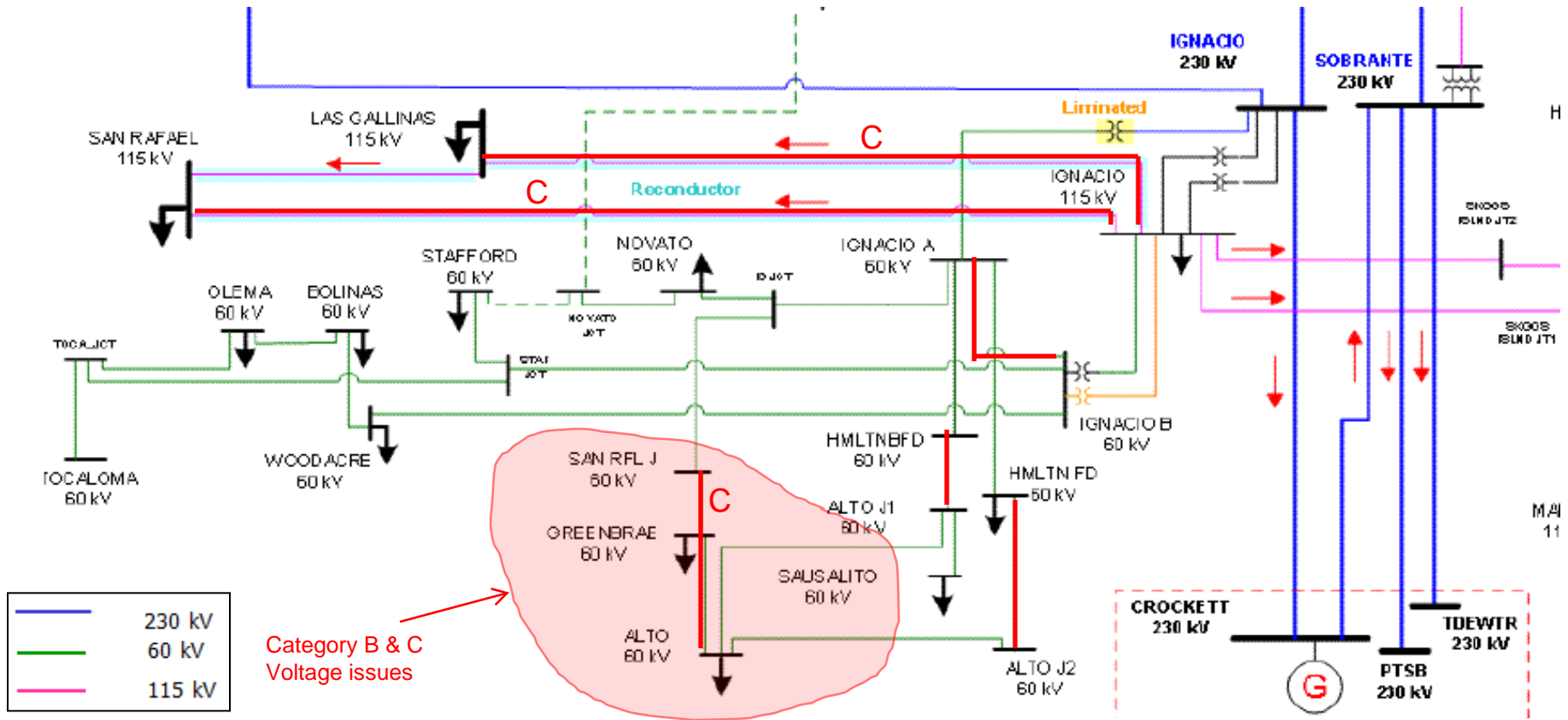
North Coast / North Bay Area – Results (Category A & B)

- Low Voltage
 - Middle Town – Hartley 60kV corridor (Cat B)
 - Mitigation – Middle town 115kV project
- Voltage Deviation
 - Calistoga – Dunbar – St. Helena area (Cat B)
 - Mitigation – Middle town 115kV project
 - Elk – Fort Ross – Monte Rio area (Cat B)
 - Mitigation – Install reactive support at Annapolis / Fort Ross
 - Ignacio – Alto 60kV area (Cat B)
 - Mitigation – Ignacio Alto Voltage conversion project
 - Mendocino – Willits – Potter valley area (Cat B)
 - Mitigation – Install a series breaker to 115kV CB #102 at Mendocino
 - Eagle Rock – Geyserville - Clear Lake 60kV area
 - Mitigation – Generation adjustment at Geysers and Middle town 115kV project

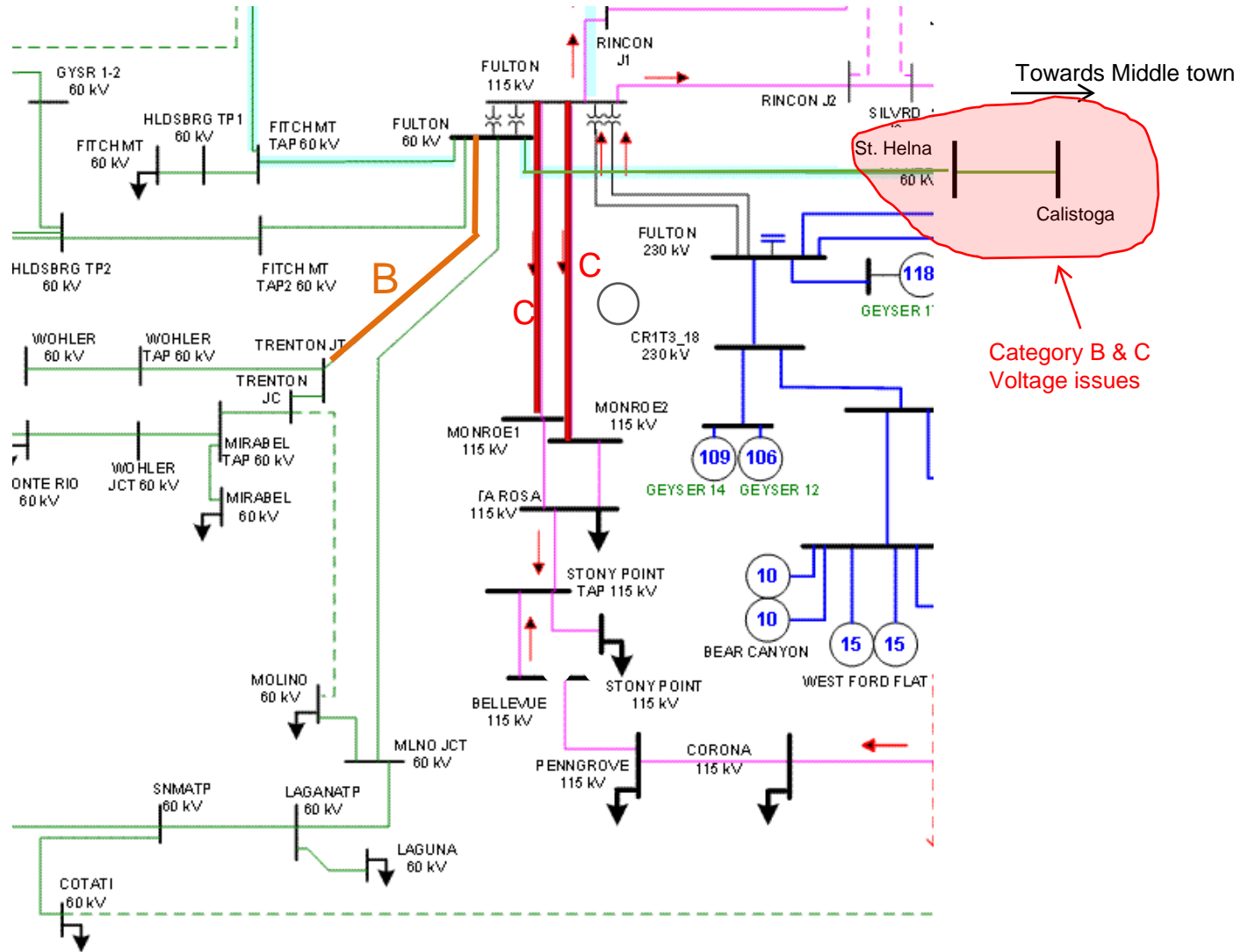
Mendocino - Eagle Rock Area issues



Ignacio – Alto area issues



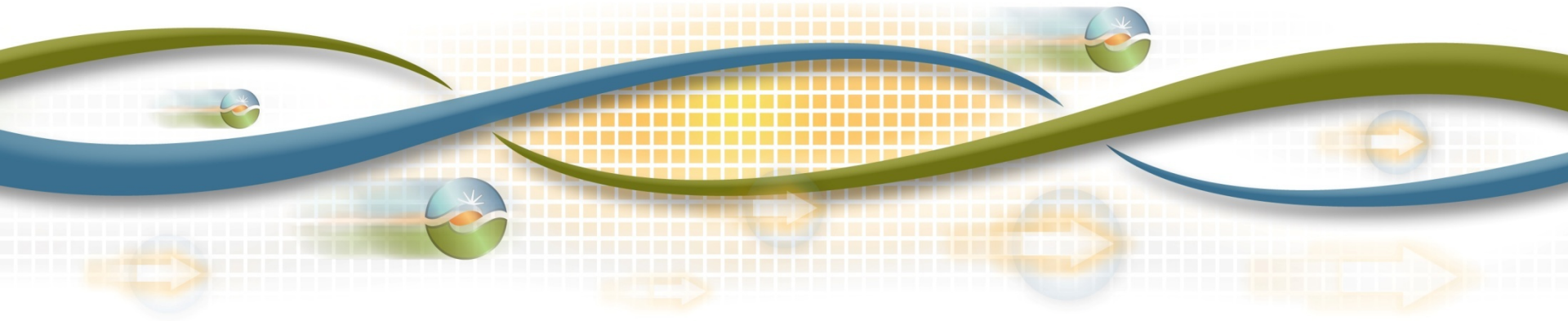
Fulton area issues



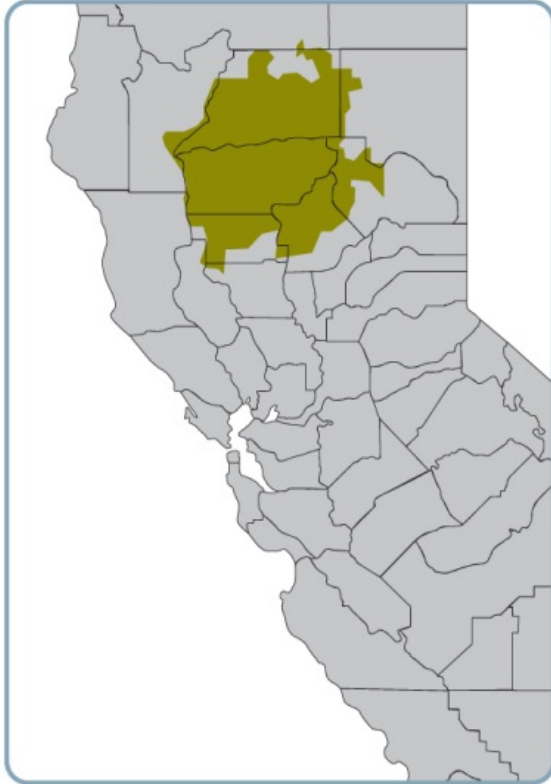
North Valley Area Preliminary Reliability Assessment Results

Binaya Shrestha
Sr. Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



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 1,008 MW in 2022

North Valley Area Assessment Summary

- The assessment identified:
 - Thermal overloads due to Category C - 14
 - Low voltages due to Category A - 3 and Category C - 13
 - Voltage deviations due to Category B - 6 and Category C - 9
- Compared to last year results:
 - 1 new low voltage under normal condition
 - 1 new thermal overload and 1 voltage deviation due to Category C contingency
 - Last year there was no project approved in this area

North Valley Area Potential Solutions

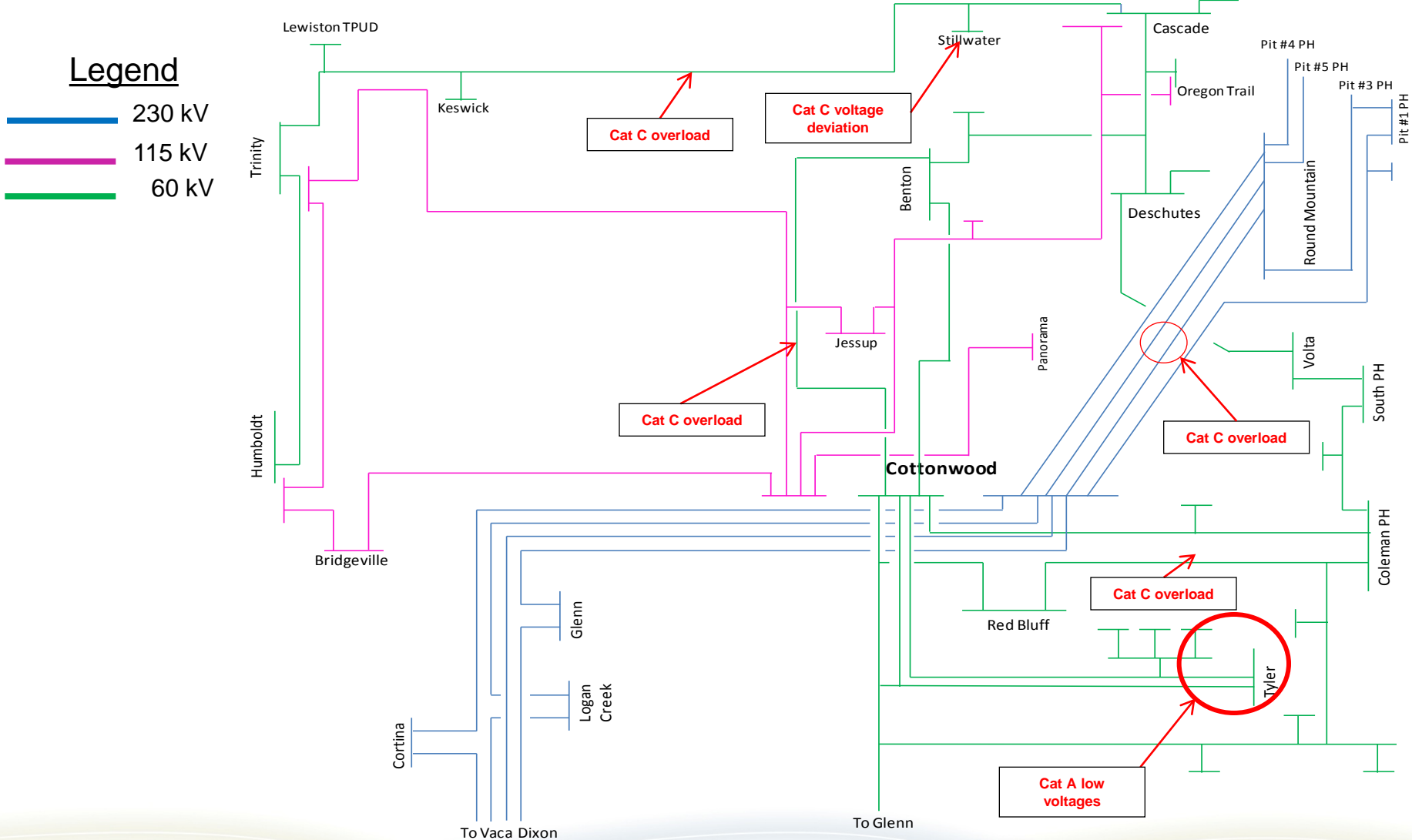
- Potential Mitigation Solutions
 - Operating solution
 - Interim operating solutions until previously approved projects get implemented
 - Upgrade bus configuration or add bus-tie breaker
 - Voltage support

North Valley Area – Results (Category A & B)

- Thermal Overloads
 - No Categories A or B thermal overloads identified.
- Low Voltage
 - Red Bluff Area 60 kV (Cat A / 2014)
 - Mitigation – Interim operating solution
- Voltage Deviation
 - Caribou Area 60 kV (Cat B / 2014)
 - Mitigation – Review existing SPS

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

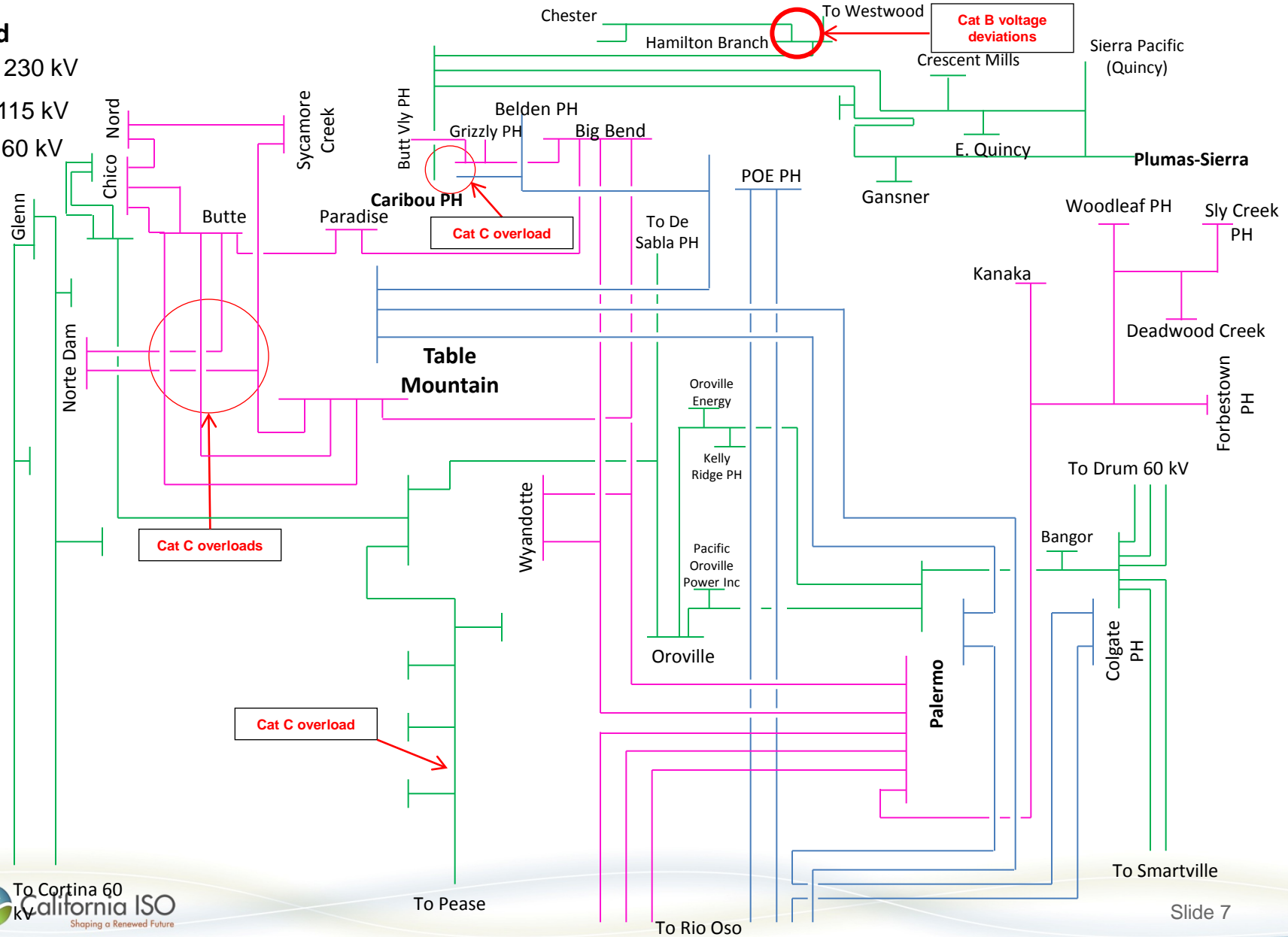
North Valley Area – Results (cont'd)



North Valley Area – Results (cont'd)

Legend

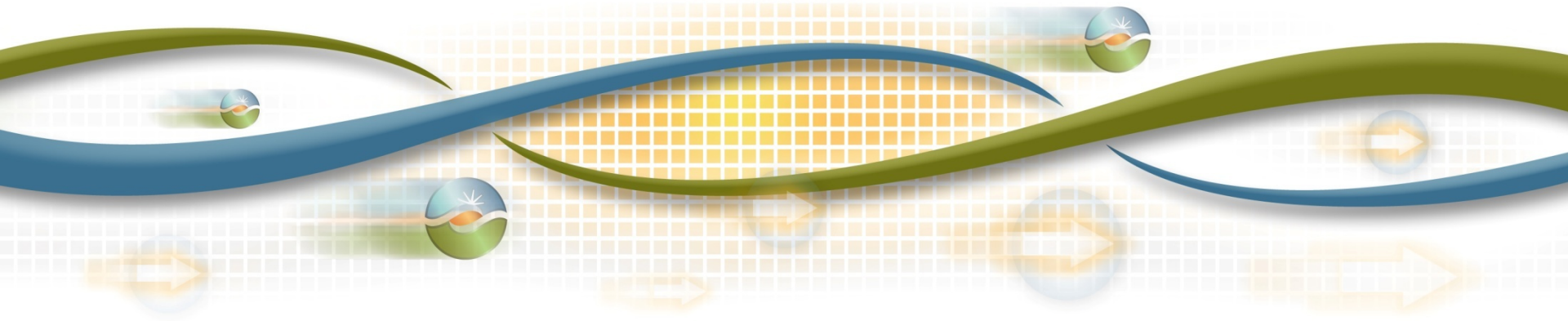
- 230 kV
- 115 kV
- 60 kV



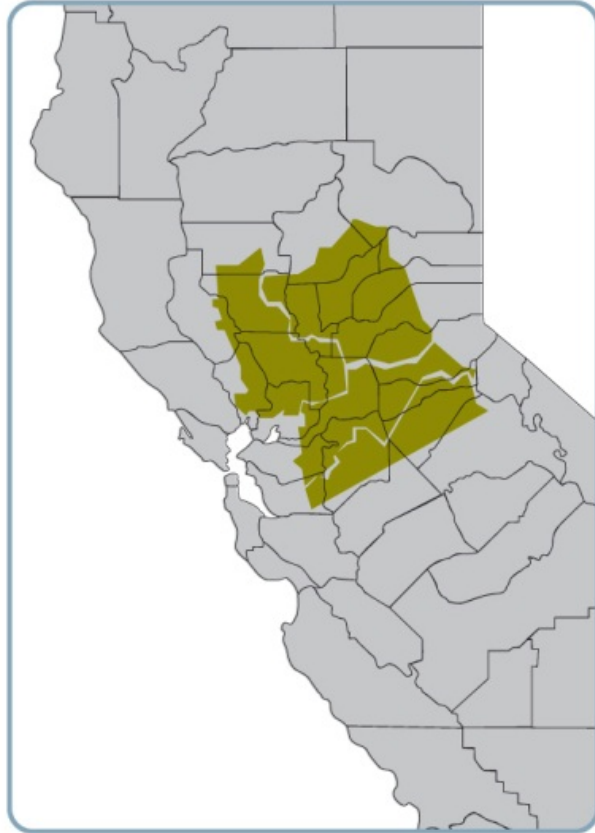
Central Valley Area Preliminary Reliability Assessment Results

Binaya Shrestha
Sr. Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



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 4,536 MW in 2022

Sacramento Area Assessment Summary

- The assessment identified:
 - Thermal overloads due to Category B – 2 and Category C - 13
 - Low voltages due to Category B – 1 and Category C - 20
 - Voltage deviations due to Category C - 11
- Compared to last year results:
 - 2 new Category B thermal overloads due to distribution load transfer
 - Last year there was no project approved in this area

Sacramento Area Potential Solutions

- Potential Mitigation Solutions
 - Operating solution.
 - Interim operating solutions until previously approved projects get implemented.
 - Voltage support.

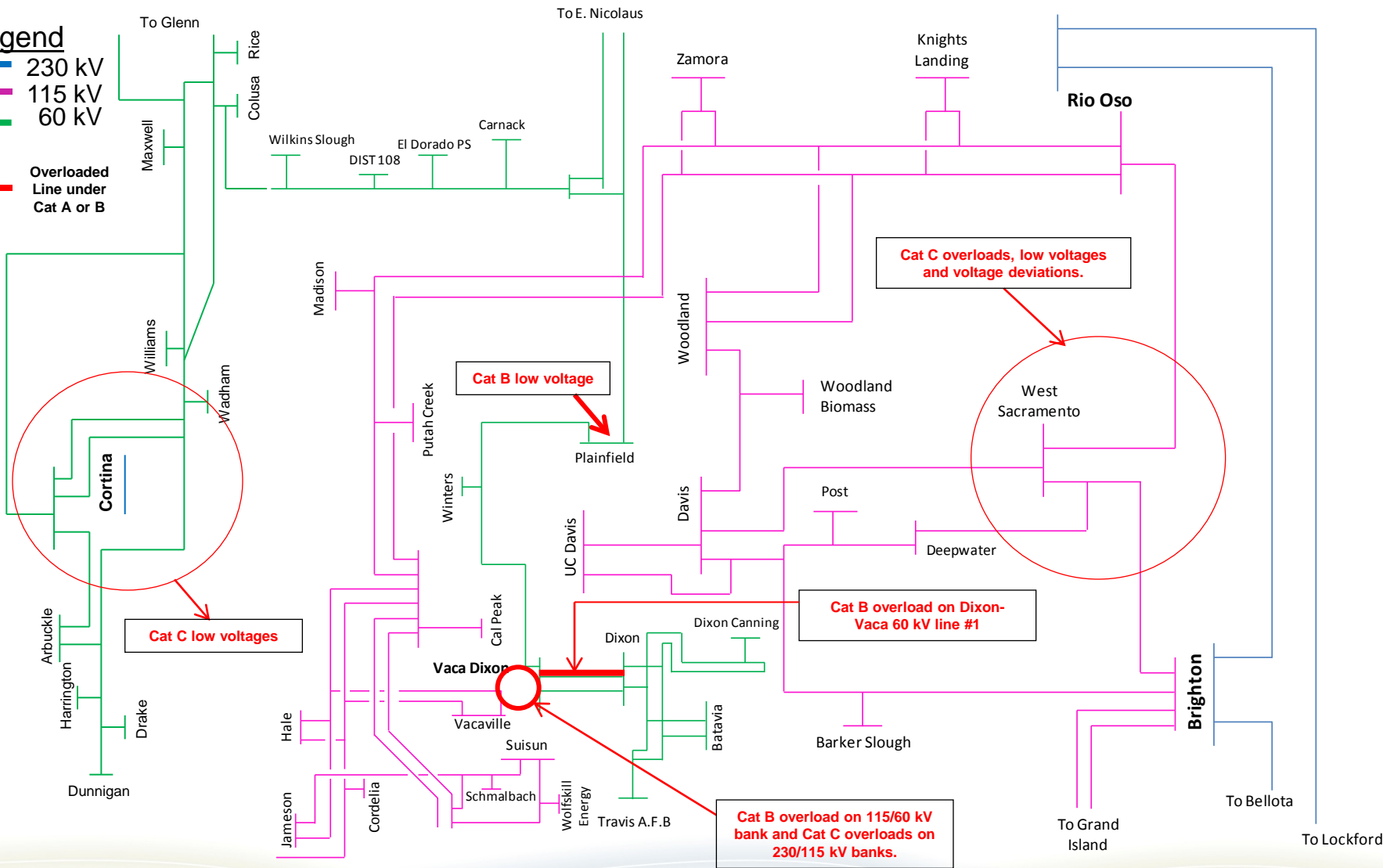
Sacramento Area – Results (Category A & B)

- Thermal Overloads
 - Dixon-Vaca 60 kV line #1 (Cat B / 2014)
 - Vaca Dixon 115/60 kV Transformer Bank #5 (Cat B / 2014)
 - Mitigation – Interim operating solution
- Low Voltage
 - Plainfield 60 kV (Cat B / 2014)
 - Mitigation – Interim operating solution
- Voltage Deviation
 - No Category B voltage deviations identified

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

Sacramento Area – Results (cont'd)

- Legend**
- 230 kV
 - 115 kV
 - 60 kV
 - Overloaded Line under Cat A or B



Sierra Area Assessment Summary

- The assessment identifies:
 - Thermal overloads due to Category A - 2, Category B - 7 and Category C - 20
 - Low voltages due to Category B - 2 and Category C - 16
 - Voltage deviations due to Category B – 4 and Category C - 7
- Comparing to last year results:
 - 1 new projects eliminated 8 low voltages under normal conditions
 - 3 new Category B thermal overloads due to load growth
 - Last year there was 1 project approved in this area

Sierra Area Potential Solutions

- Potential Mitigation Solutions
 - Operating solution.
 - Interim operating solutions until previously approved projects get implemented.
 - Area reinforcement solution.
 - Rerate.
 - Transformer bank replacement.

Sierra Area – Results (Category A & B)

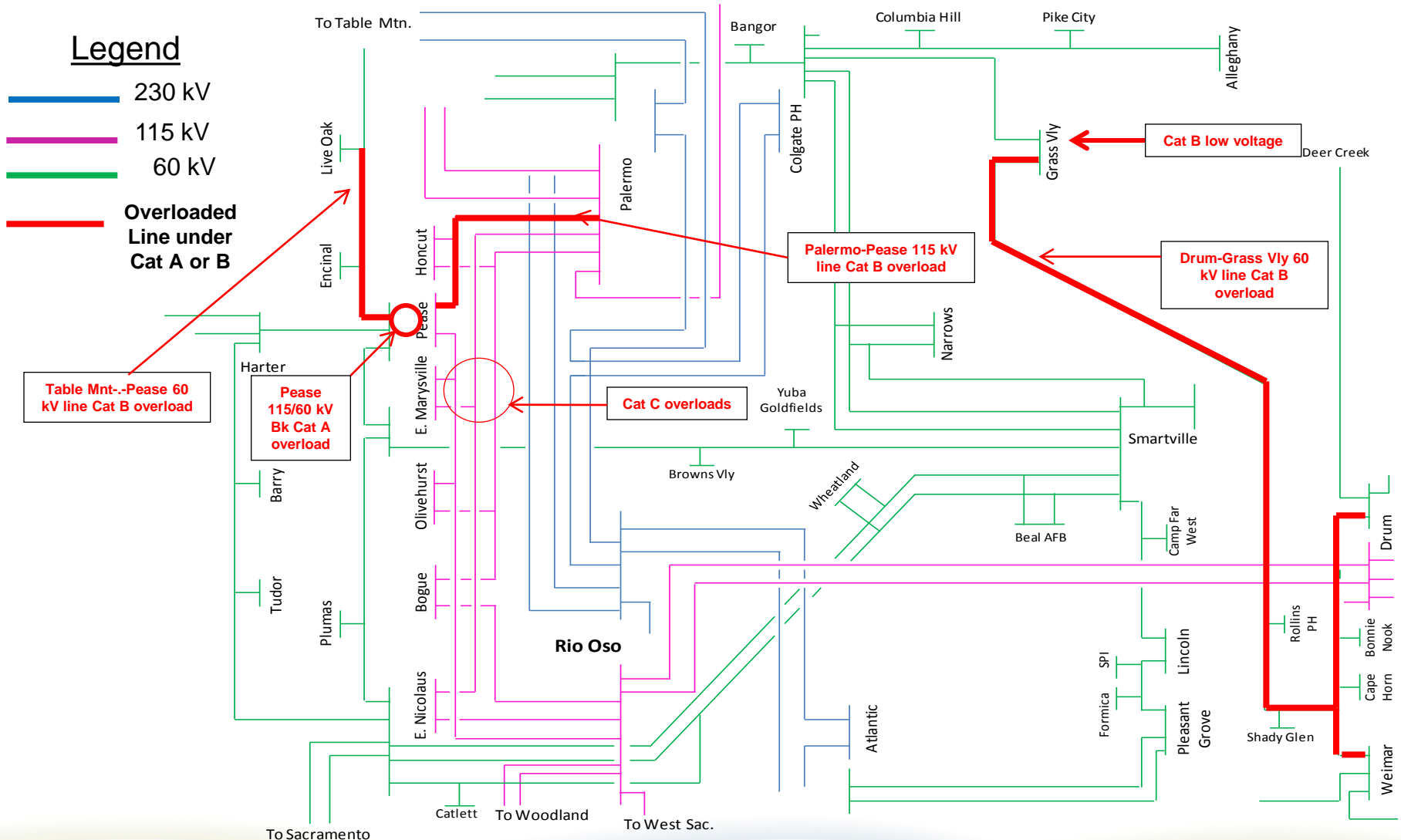
- Thermal Overloads
 - Drum-Higgins 115 kV line (Cat A / ~2019)
 - Mitigation – Drum-Placer Area Reinforcement
 - Placer 115/60 kV Bank # 1 (Cat A / ~2020)
 - Mitigation – Drum-Placer Area Reinforcement
 - Drum-Grass Valley-Weimer 60 kV line (Cat B / 2014)
 - Mitigation – Drum-Placer Area Reinforcement. Disable automatics for interim.
 - Gold Hill 230/115 kV Transformers # 1 & 2 (Cat B / 2022)
 - Mitigation – Drum-Placer Area Reinforcement
 - Pease 115/60 kV bank # 2 (Cat B / ~2020)
 - Mitigation – Replace transformer bank
 - Palermo - Pease 115 kV Line (Cat B / 2017)
 - Mitigation – Interim operating solution
 - Table Mountain - Pease 60 kV Line (Cat B / 2014)
 - Mitigation – Operating solution

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

- Low Voltage
 - Grass Valley Area 60 kV (Cat B / 2017)
 - Mitigation – Drum-Placer Area Reinforcement. Disable automatics for interim.
- Voltage Deviation
 - Pease Area 60 kV (Cat B / 2014)
 - Mitigation – Operating solution

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

Sierra Area – Results (cont'd)

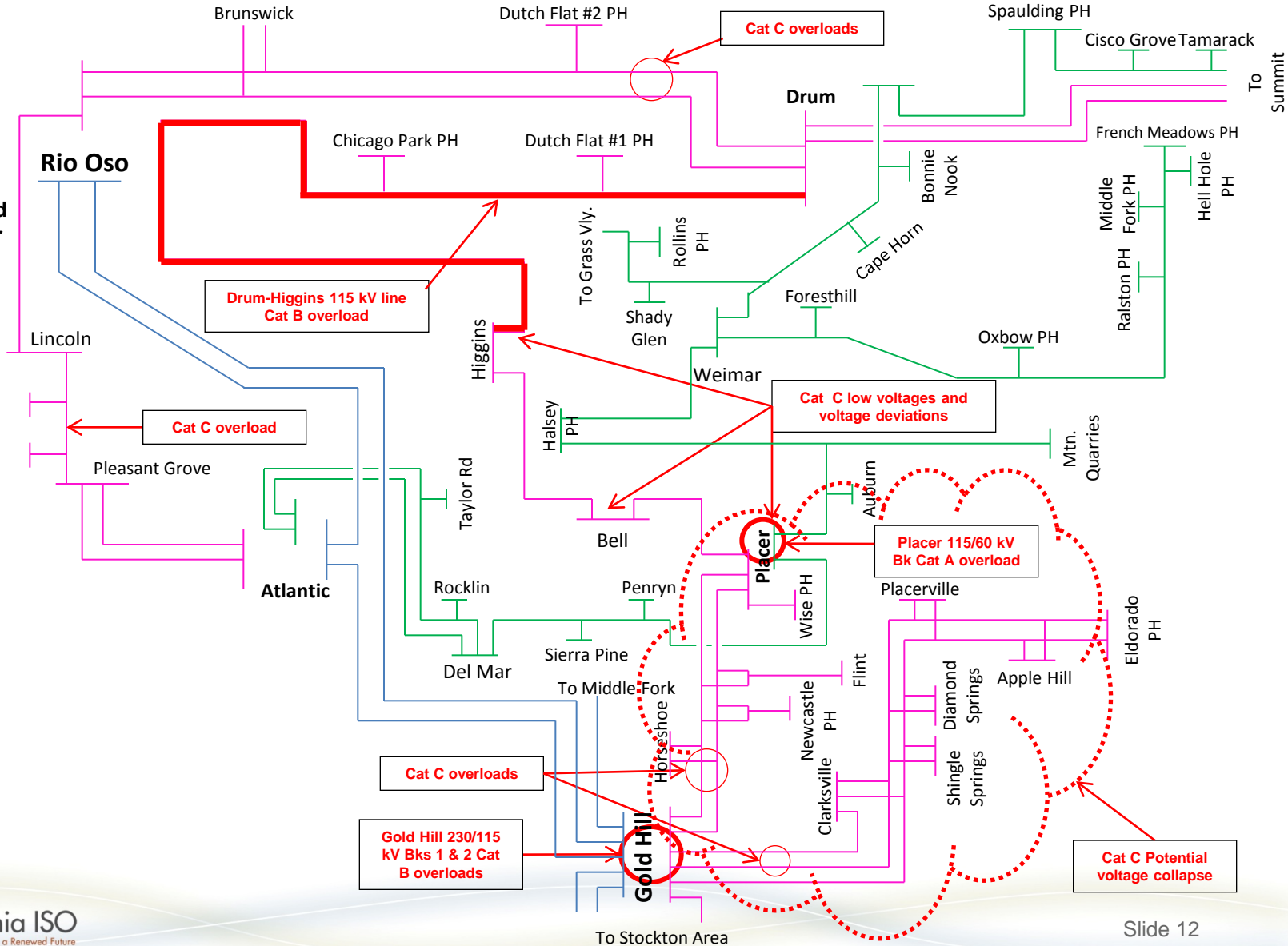


Sierra Area – Results (cont'd)

Legend

- 230 kV
- 115 kV
- 60 kV

**Overloaded
Line under
Cat A or B**



Stockton/Stanslaus Area Assessment Summary

- The assessment identifies:
 - Thermal overload due to Category A - 1 and Category C - 14
 - Low voltages due to Category C - 5
 - Voltage deviations due to Category C - 4
- Comparing to last year results:
 - 1 thermal overload under normal condition eliminated due to new generation project
 - 2 Category B thermal overloads eliminated due to previously approved projects
 - 1 new thermal overload under normal condition due to load growth
 - Last year there was no project approved in this area

Stockton/Stanslaus Area Potential Solutions

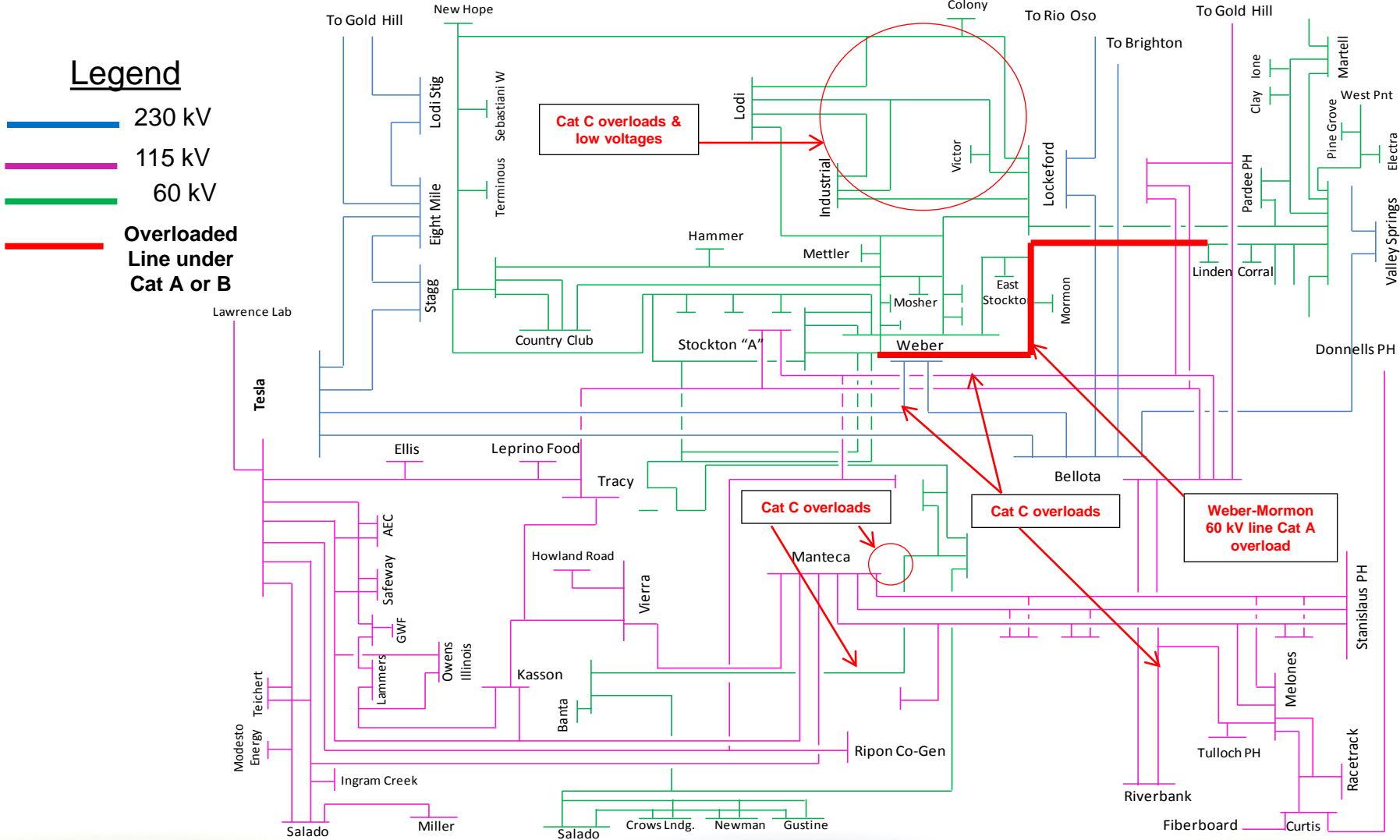
- Potential Mitigation Solutions
 - Operating solution.
 - Interim operating solutions until previously approved projects get implemented.
 - Bus configuration upgrade or add sectionalizing breaker.
 - Area reinforcement solution.
 - Rerate.

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

- Thermal Overloads
 - Weber - Mormon 60 kV line (Cat A / ~2021)
 - Mitigation – Rerate
- Low Voltage
 - No Categories A or B low voltages identified
- Voltage Deviation
 - No Category B voltage deviations identified

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

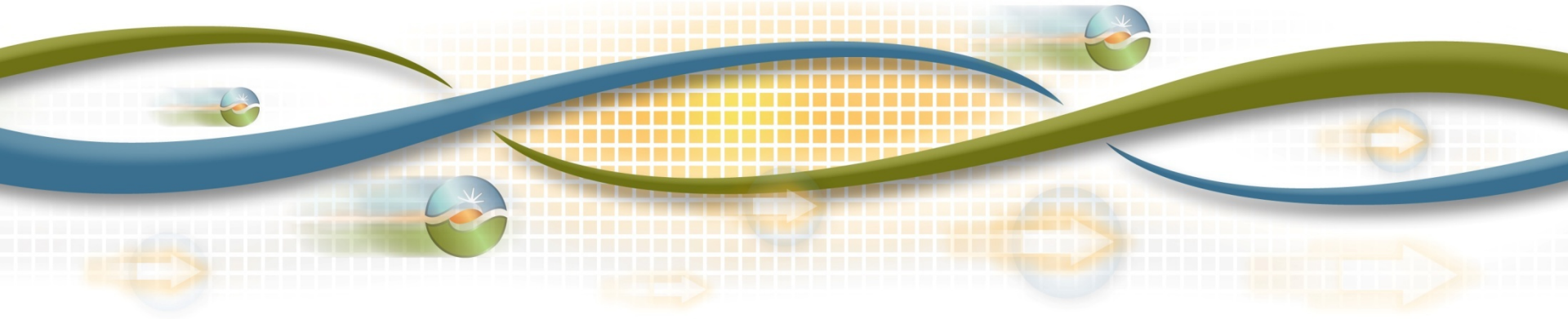
Stockton/Stanislaus Area – Results (cont'd)



Greater Bay Area (GBA) Preliminary Reliability Assessment Results

Bryan Fong
Sr. Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



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 & kV transmission facilities.
- Summer Peak 10,400 MW in 2022

GBA Assessment Summary

- The assessment identified:
 - Thermal overloads (summer peak) due to Category B - 12 and Category C - 9
 - Thermal overloads (winter peak) due to Category B - 2 and Category C - 146
 - Low voltages (summer peak) due to Category B - 1 and Category C - 3
 - Low voltage (winter peak) due to Category C - 1
 - Voltage deviations (summer & winter) due to Category B - 1 and Category C – 3 area

GBA Assessment Summary

- Compared to last year results:
 - No Category A overload
 - 15 Category B overloads and numerous Category C overloads
 - Low voltages on 60 kV substations caused by Category C contingencies
 - 3 new approved projects eliminated multiple Category B and Category C overloads.

GBA Potential Solutions

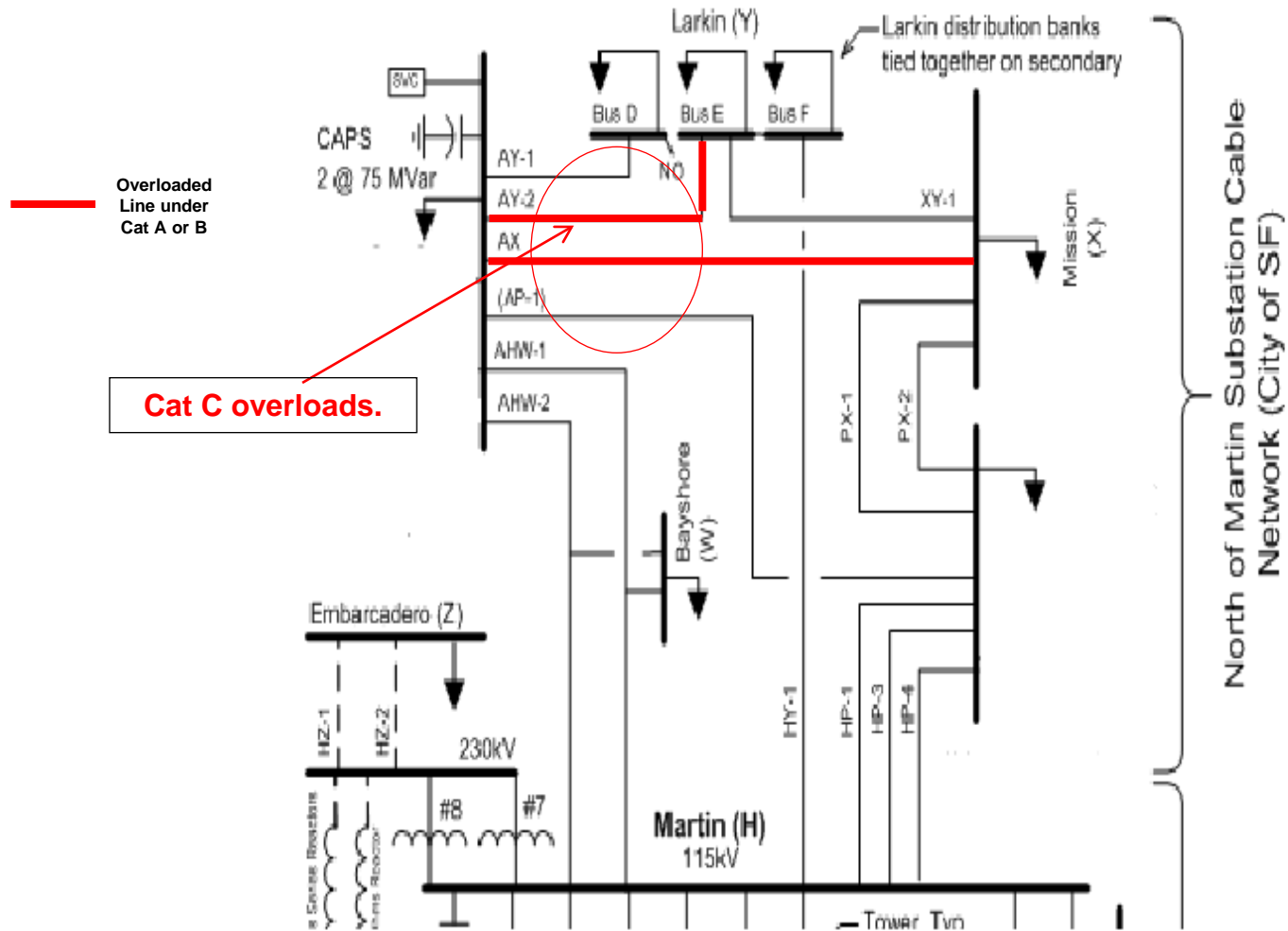
- Potential Mitigation Solutions
 - Operating solution, SPS (Overload, voltage issues mostly Category C)
 - Interim operating solutions until previously approved projects get implemented.
 - Voltage support.

San Francisco Area – Results (Category A & B)

- Thermal Overloads
 - Potrero - Mission (AX) 115 kV Cable (Cat B / 2014)
 - Existing TBC DC Runback Scheme
 - Potrero - Larkin #2 (AY-2) 115 kV Cable (Cat B / 2017)
- Low Voltage
 - No Category A nor B low voltage identified
- Voltage Deviation
 - No Category A nor B voltage deviations identified

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

San Francisco Area – Results (cont'd)



San Jose Area – Results (Category A & B)

- Thermal Overloads
 - Newark-Dixon Landing 115 kV Line (Cat B / 2014)
 - Mitigation – Mabury Voltage Conversion Project
 - Piercy-Metcalf 115 kV Line (Cat B / 2014)
 - Mitigation – Mabury Voltage Conversion Project
 - Los Esteros-Montague 115 kV Line (Cat B / 2022)
 - Markham No. 1 115 kV Tap (Cat B / 2017)
 - NRS-Scott No. 1 115 kV Line (Cat B / 2014)
- Low Voltage
 - ALMADEN 60kV (Cat B / 2014)
 - LOS GATOS 60 kV (Cat B / 2014)

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

San Jose Area – Results (Category A & B)

- Voltage Deviation
 - ALMADEN 60kV (Cat B / 2014)
 - LOS GATOS 60 kV (Cat B / 2014)
 - ZANKER 115kV (Cat B / 2014)
 - ELPT_SJ2 115kV (Cat B / 2014)
 - IBM-HR J 115kV (Cat B / 2014)
 - MABURY J 115kV (Cat B / 2014)
 - MARKHAM 115kV (Cat B / 2014)
 - IBM-CTLE 115kV (Cat B / 2014)
 - ZANKER 115kV (Cat B / 2014)
 - EDNVL J1 115kV (Cat B / 2014)
 - Mitigation – Reactive Support

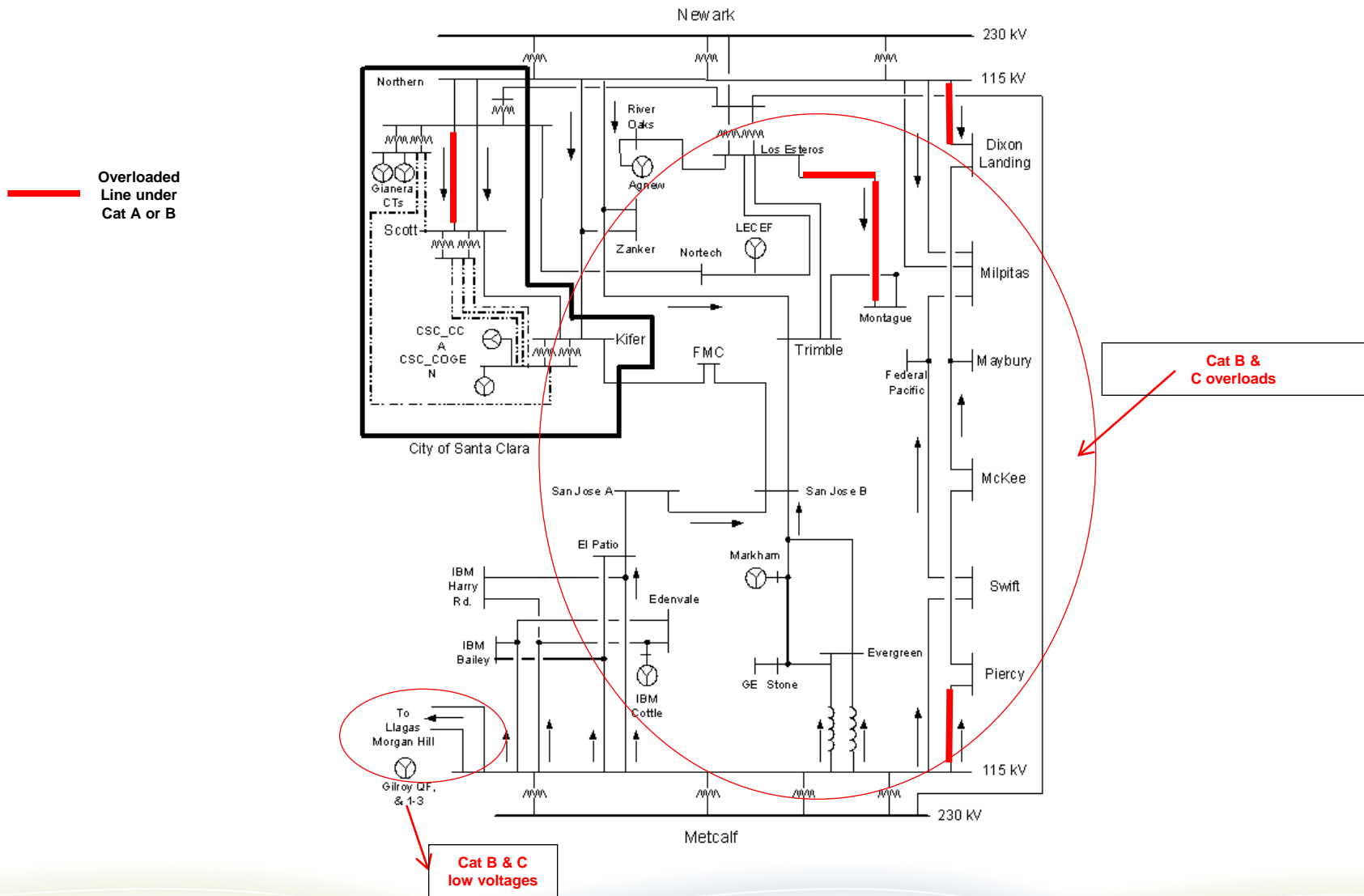
Category C problems will be discussed in the area diagram in next slide

San Jose Area – Results (Category A & B)

- Voltage Deviation
 - EVRGRN J 115kV (Cat B / 2014)
 - EDNVL J3 115kV (Cat B / 2014)
 - GILROYTP 115kV (Cat B / 2014)
 - GILROYPK 115kV (Cat B / 2014)
 - STONE 115kV (Cat B / 2014)
 - GILROYTP 115kV (Cat B / 2014)
 - GILROYPK 115kV (Cat B / 2014)
 - STONE 115kV (Cat B / 2014)
 - Mitigation – Reactive Support

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

San Jose Area – Results (cont'd)

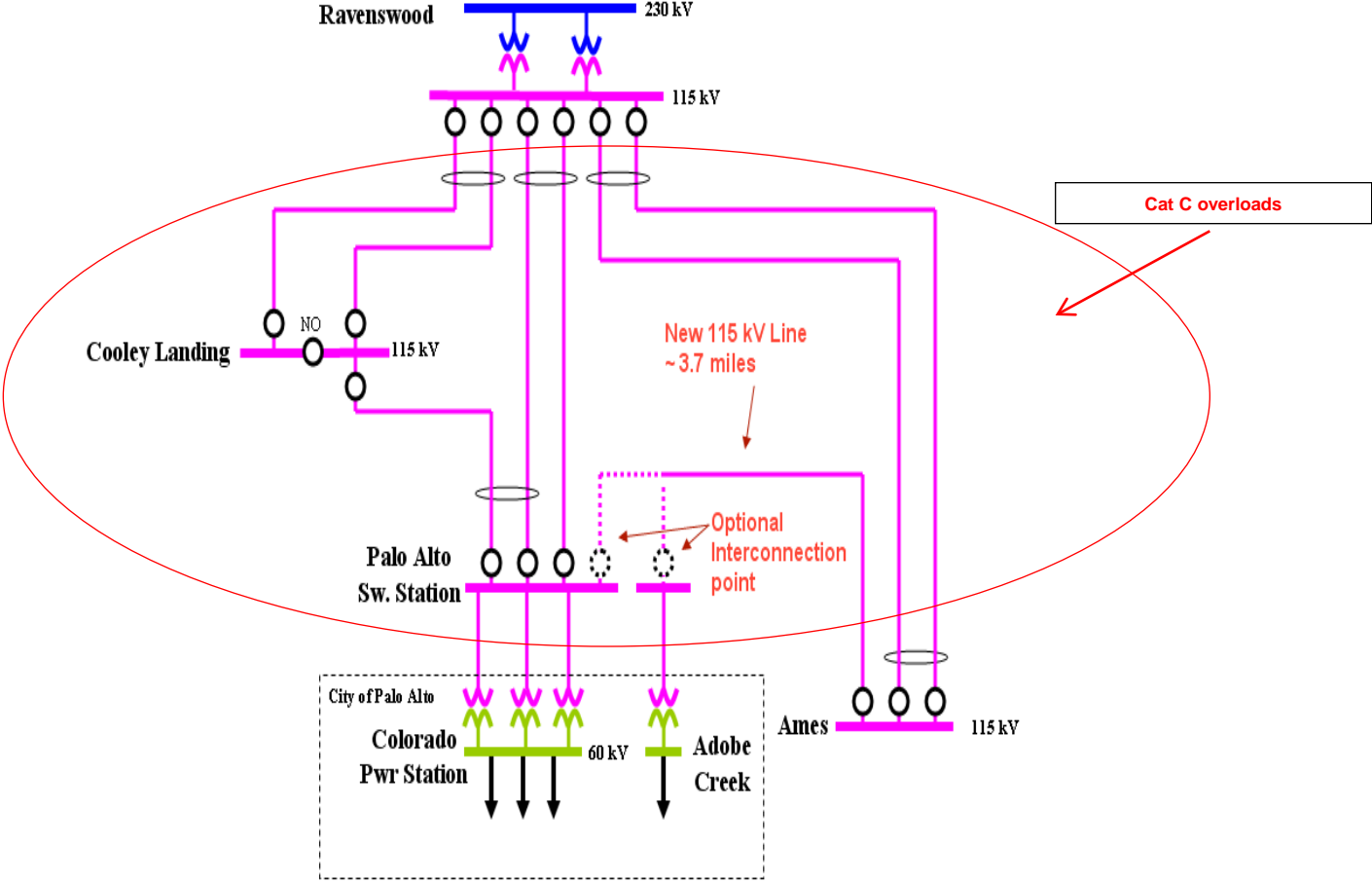


Peninsula Area – Results (Category A & B)

- Thermal Overloads
 - No Category A nor B overloads identified
- Low Voltage
 - No Category A nor B low voltage identified
- Voltage Deviation
 - No Category A nor B voltage deviations identified

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

Peninsula Area – Results (cont'd)



Mission Area – Results (Category A & B)

- Thermal Overloads
 - Dumbarton - Newark 115 kV Line (Cat B / 2014)
 - Mitigation – East Shore - Oakland J 115 kV Reconductor Project
- Low Voltage
 - No Category A nor B low voltage identified
- Voltage Deviation
 - SEAWEST 60kV
 - USWP-WKR 60kV
 - ZONDWD 60kV
 - PARKS 60kV
 - USWP-FRK 60kV
 - ALTAMONT 60kV

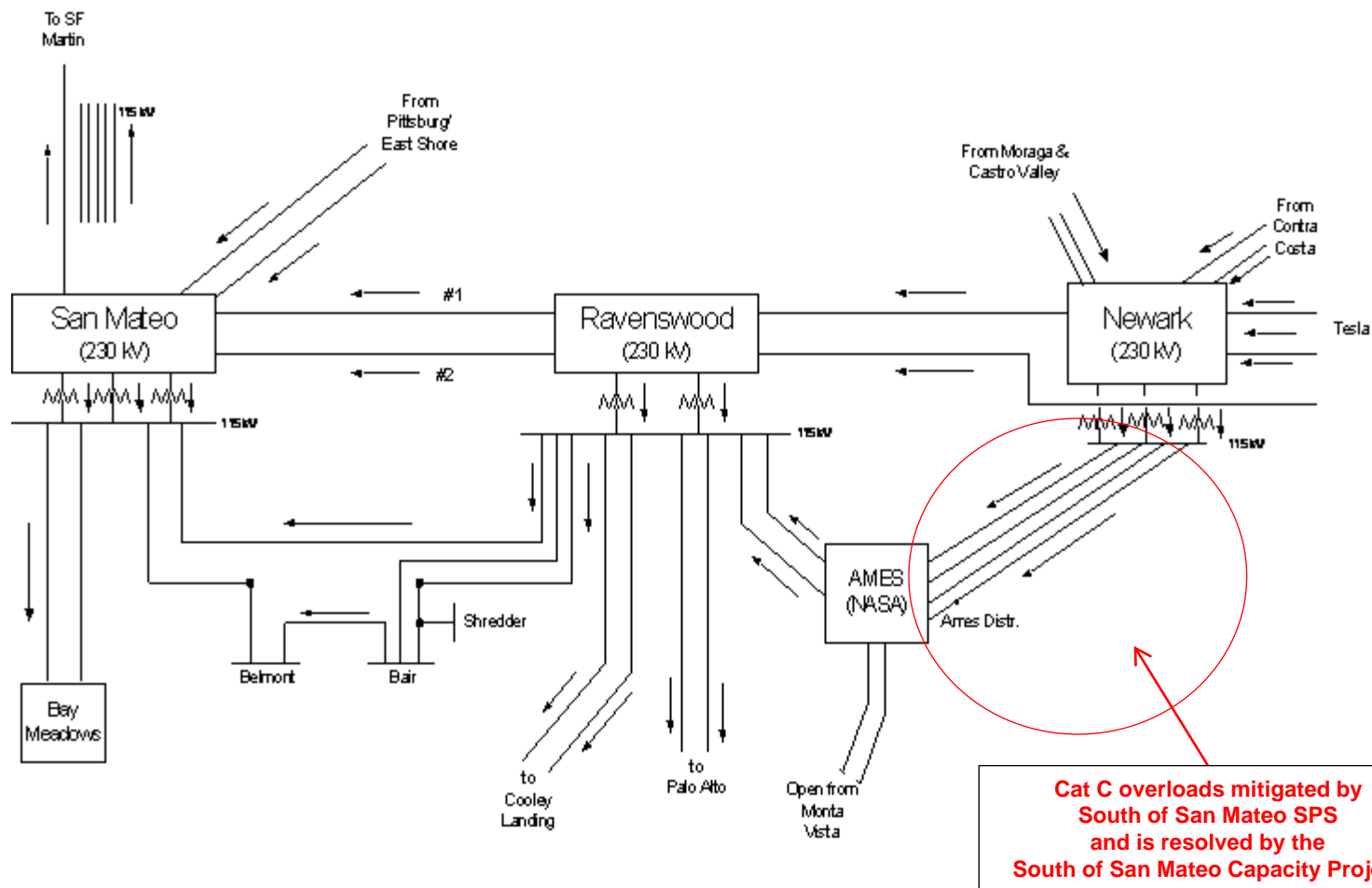
Category C problems will be discussed in the area diagram in next slide

Mission Area – Results (Category A & B)

- Voltage Deviation
 - IUKA 60kV
 - SUNOL 60kV
 - FLOWIND1 60kV
 - E DUBLIN 60kV
 - CALMAT60 60kV
 - VINEYARD 60kV
 - Mitigation – Add reactive support

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

Mission Area – Results (cont'd)

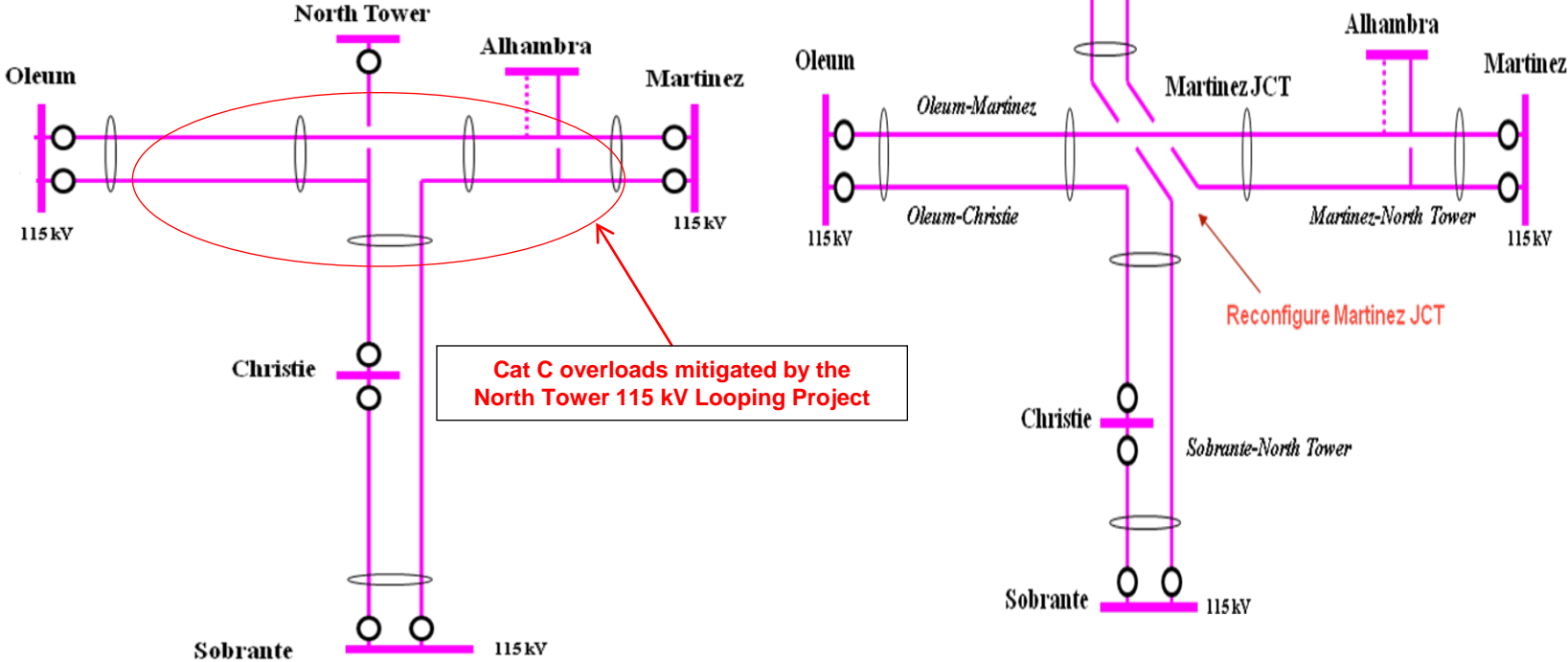


East Bay Area – Results (Category A & B)

- Thermal Overloads
 - No Category A nor B overloads identified
- Low Voltage
 - STD. OIL 115kV (Cat A / 2014)
 - Mitigation – Add reactive support
- Voltage Deviation
 - EDES 115kV
 - Mitigation – Add reactive support

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

East Bay Area – Results (cont'd)

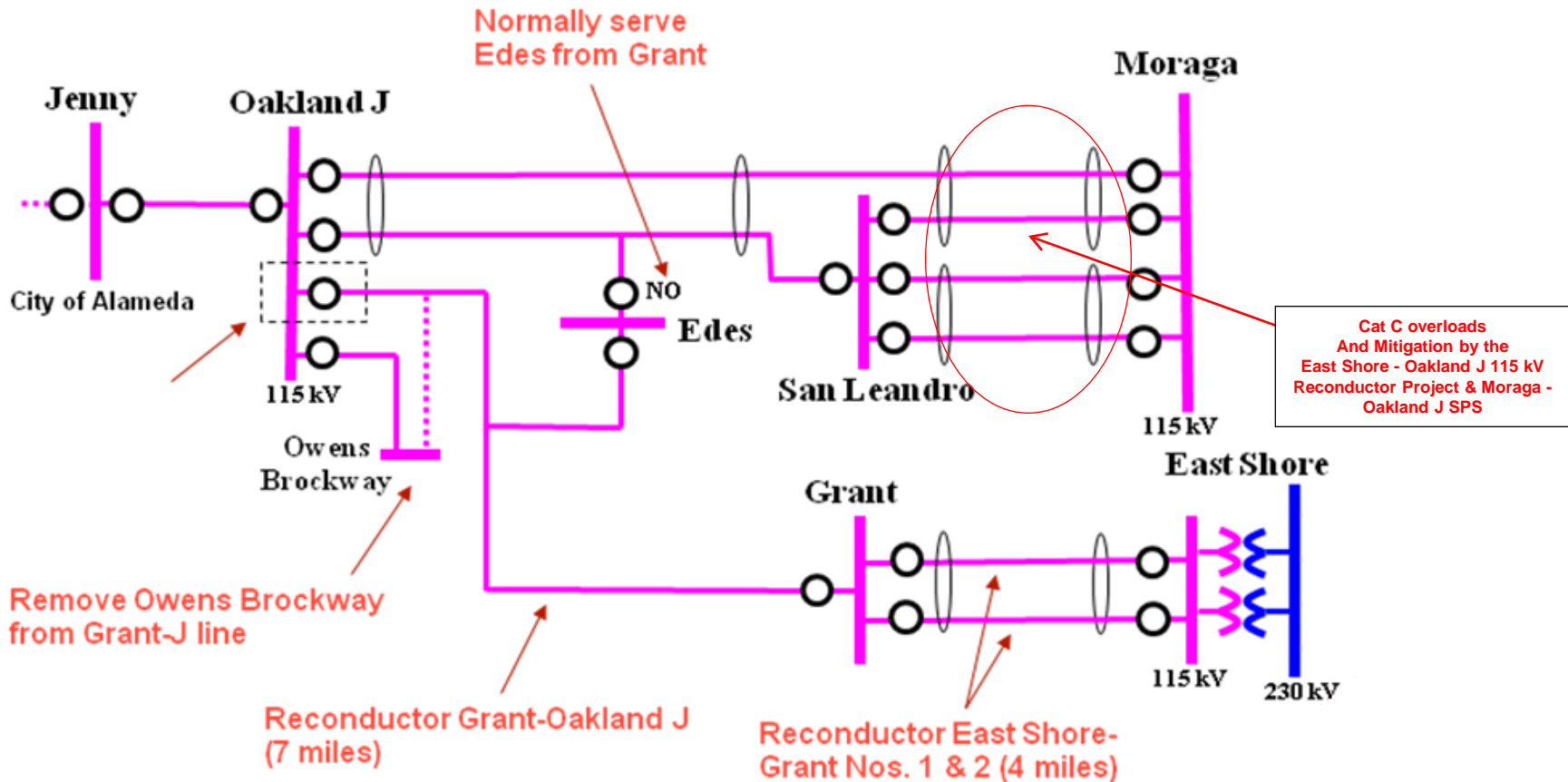


Diablo Area – Results (Category A & B)

- Thermal Overloads
 - Contra Costa PP - Contra Costa Sub 230 kV Line (Cat B / 2014)
 - Mitigation – Reduce Marsh Landing generation
- Low Voltage
 - No Category A nor B low voltage identified
- Voltage Deviation
 - RVEC 115kV
 - BIXLER 60kV
 - Mitigation – Add reactive support

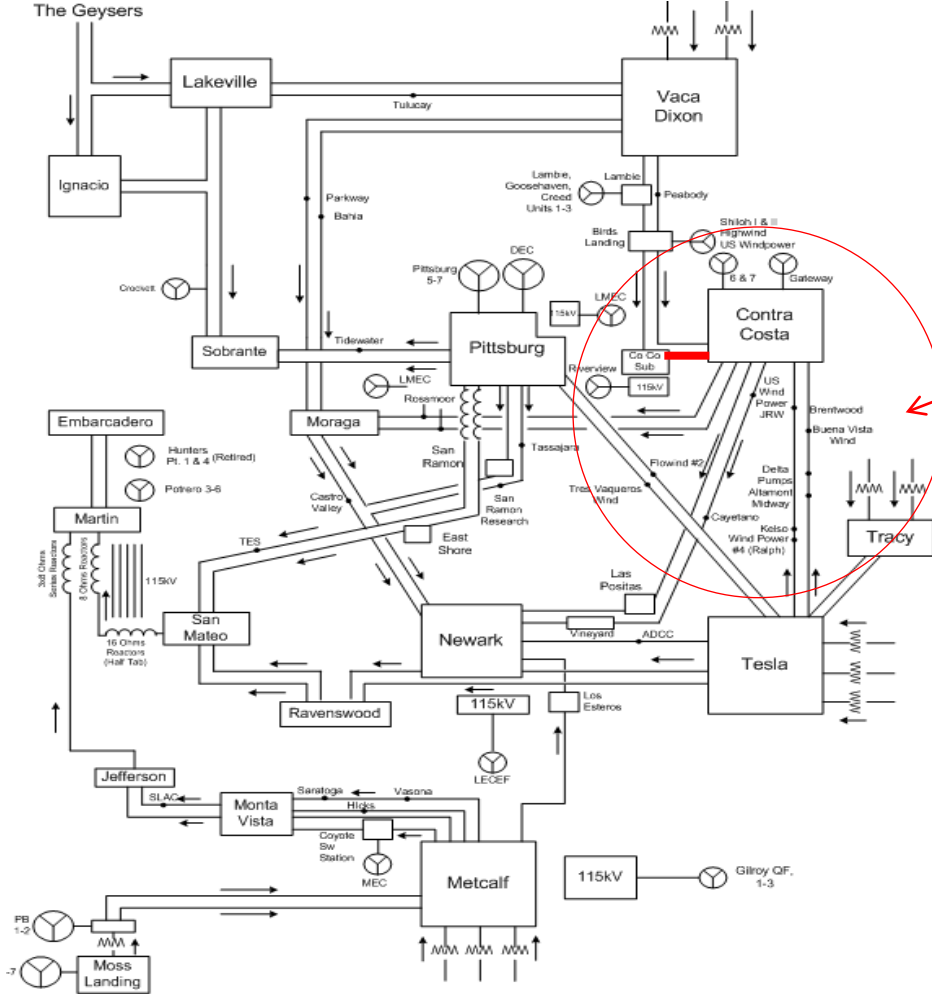
Category C problems will be discussed in the area diagram in next slide

Diablo Area – Results (cont'd)



Diablo Area – Results (cont'd)

Overloaded Line under Cat A or B



Cat C overloads and Mitigation by the Oakley Generating Station Network Upgrades

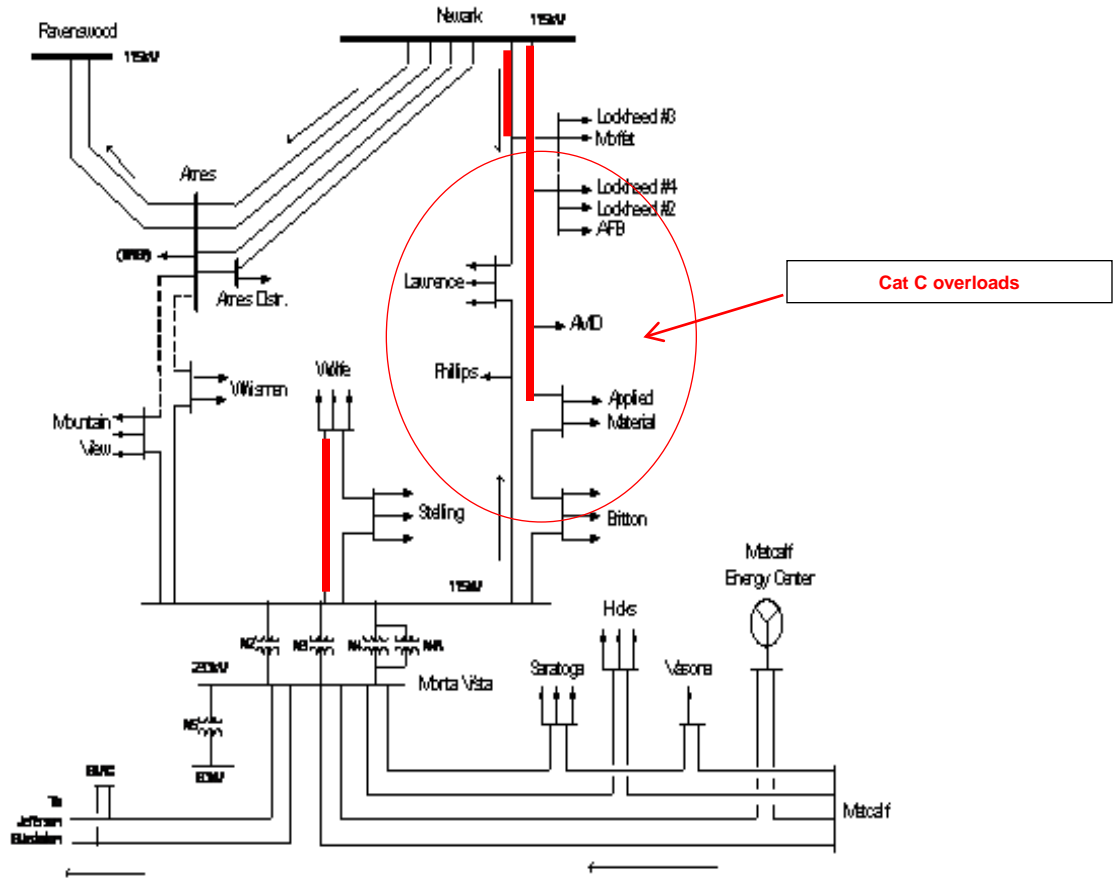
De Anza Area – Results (Category A & B)

- Thermal Overloads
 - Newark-Applied Materials 115 kV Line (Cat B / 2017)
 - Monta Vista-Wolfe 115 kV Line 115 kV Line (Cat B / 2017)
 - Lockheed No. 1 Tap 115 kV Line (Cat B / 2017)
- Low Voltage
 - No Category A nor B low voltage identified
- Voltage Deviation
 - LOYOLA 60kV (Cat B / 2014)
 - Mitigation – Add reactive support

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

De Anza Area – Results (cont'd)

Overloaded Line under Cat A or B

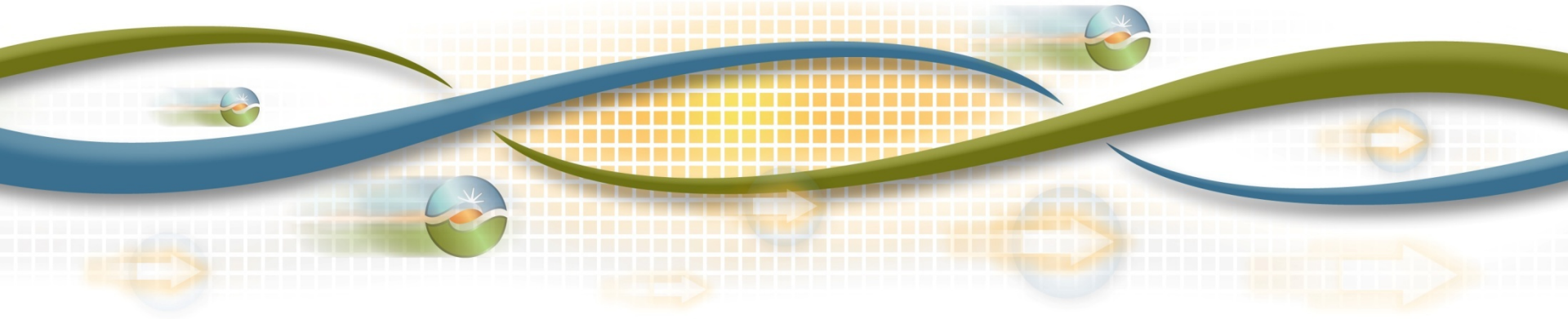


Cat C overloads

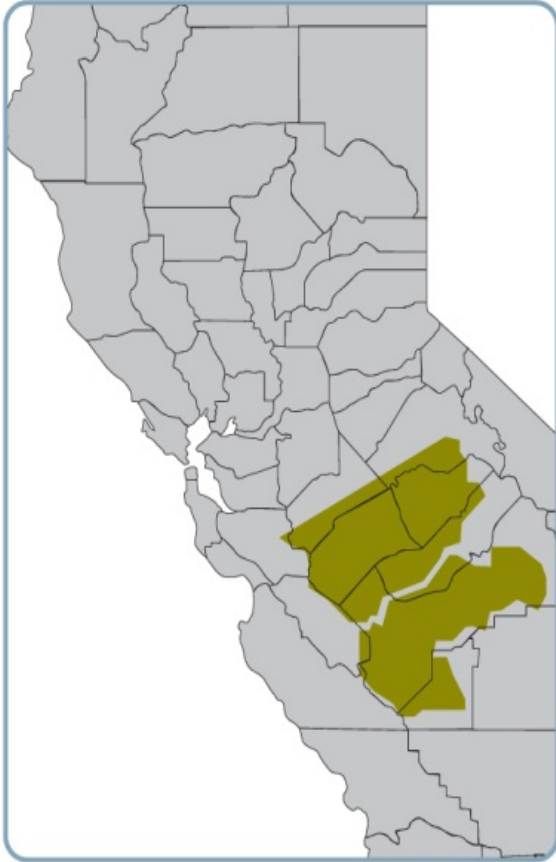
Fresno & Kern Areas Preliminary Reliability Assessment Results

Joseph E Meier
Senior Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



Greater Fresno Area



- Includes the San Joaquin Division
- Generation: Over 3,200 MW of generation
- Comprised of 60, 115, 230 & 500 kV transmission facilities.
- Summer Peak 3,595 MW in 2022

Fresno Area Assessment Summary

- The assessment identified:
 - Thermal overloads due to Category A – 3, Category B - 4 and Category C - 43
 - Low voltages due to Category B - 3 and Category C - 21
 - Voltage deviations due to Category B - 7 and Category C - 23
- Compared to last year results:
 - 2 Category A problems not previously identified
 - Warnerville-Wilson 230kV overload (2017 Partial Peak)
 - Kearney-Caruthers 70kV (~2019 Peak)

Fresno Area Proposed Solutions

- Potential Mitigation Solutions
 - Operating Procedures, SPS (Overload, voltage issues mostly Category C)
 - Upgrade SPS to reduce generation from Exchequer PH
 - Current SPS drops Exchequer PH for loss of Exchequer-Le Grand 115kV line
 - Transmission line reconductor
 - Transmission line Voltage upgrade (ie. 115kV to 230kV)
 - Add or replace transformers

Fresno Area – Results (Category A & B)

■ Thermal Overloads (Category A)

- Kearney-Caruthers 70kV (~2019)
- Helm-Kerman 70kV (2014 only)
- Warnerville-Wilson 230kV (2017 Partial Peak)

■ Thermal Overloads (Category B)

- Kearney #2 230/70kV (2014 on)
- Los Banos-Livingston Jct-Canal 70kV (2014 only)
- Kearney-Kerman 70kV (2014 on)
- Midway-Gates 230kV (2017 Off Peak)

■ Low Voltage (Category B)

- Mariposa 70kV (2017 on)
- Bear Valley 70kV area (2017 Partial Peak)
- Avenal 70kV area (2017 Partial Peak)

■ Voltage Deviation (Category B)

- Mariposa 70kV, Bonita 70kV, Chowchilla 115kV, Oakhurst 115kV (All models, see results spreadsheet)

Fresno Area – Results

- Thermal Overloads

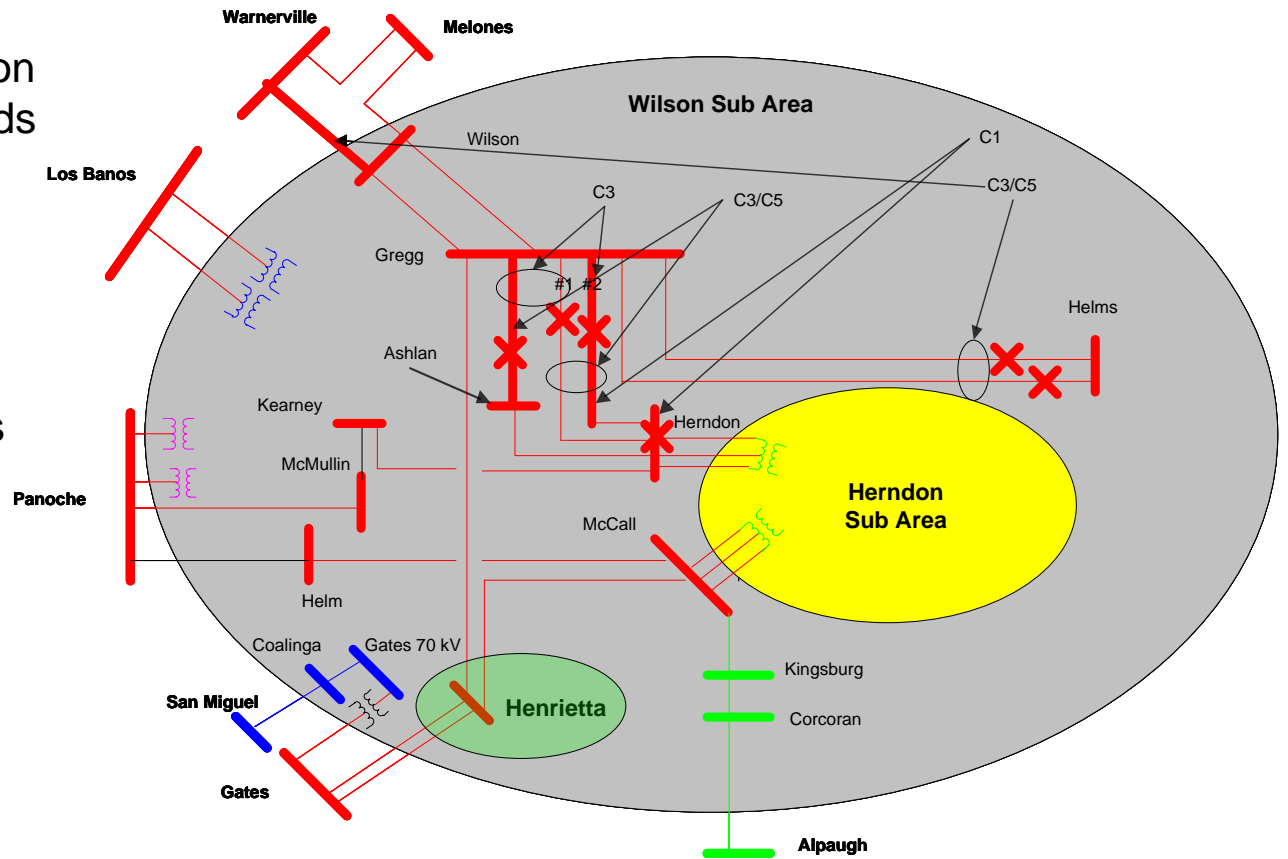
- N-1-1 on Gregg-Herndon 230kV corridor overloads remaining line
- C3/C5 of Gregg-Helms #1 & #2 230kV lines overloads Warnerville-Wilson 230kV
- C2 Herndon 230kV bus outage overloads Warnerville-Wilson 230kV

- Voltage Deviation

- Henrietta 230kV

- Potential Mitigation

- Redispatch Fresno generation
- Reconductor 230kV lines
- BAAH at Henrietta 230kV



Fresno Area – Results

Thermal Overloads

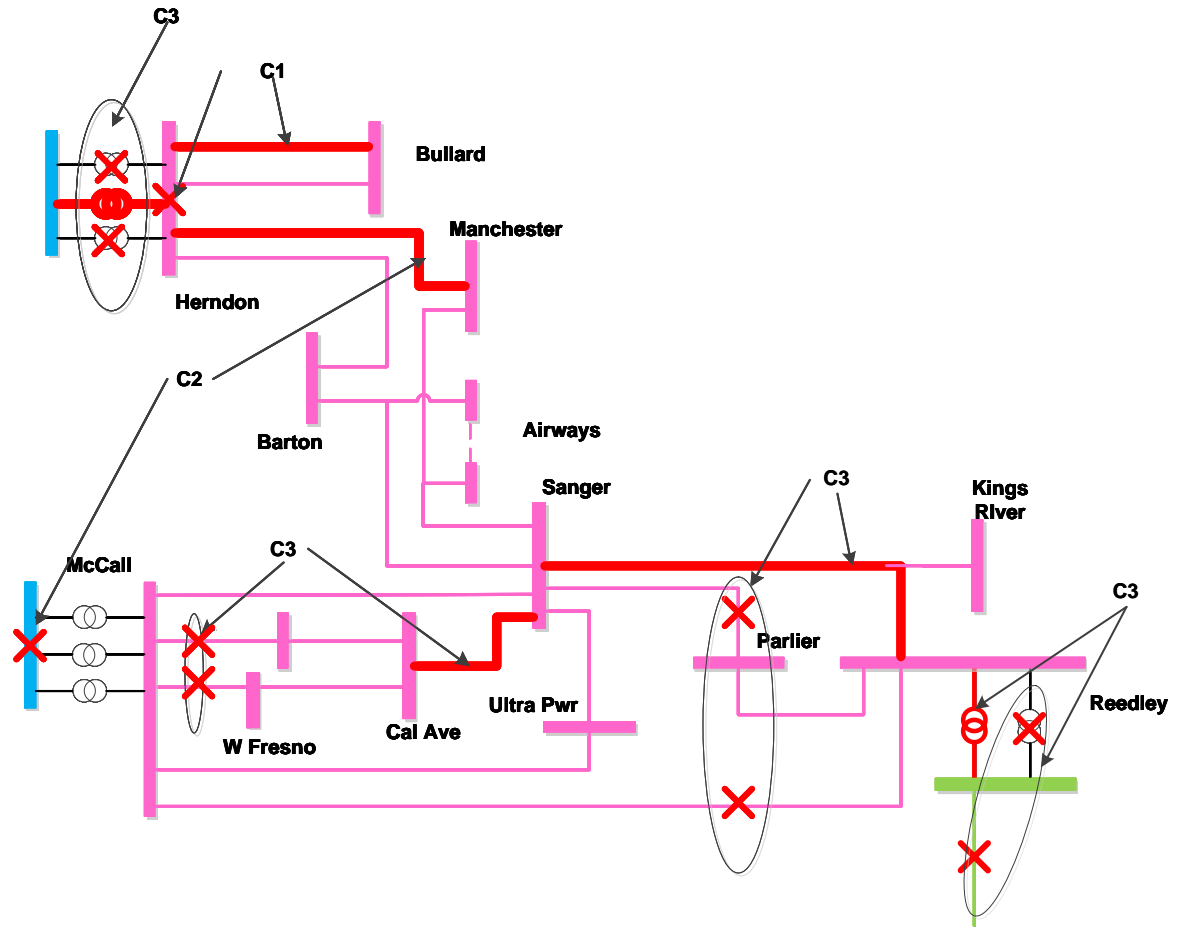
- Herndon-Bullard #1 115kV
- Manchester-Herndon 115kV
- Cal Ave-Sanger 115kV
- Sanger-Reedley 115kV
- Herndon #2 230/115kV

Voltage Deviation

- McCall 115kV
- West Fresno 115kV
- Wahtoke 115kV

Potential Mitigation

- Reconductor Herndon-Bullard 115kV
- SPS to drop load for loss of McCall 230kV bus
- Reconductor Cal Ave-Sanger 115kV



Fresno Area – Results

■ Thermal Overloads

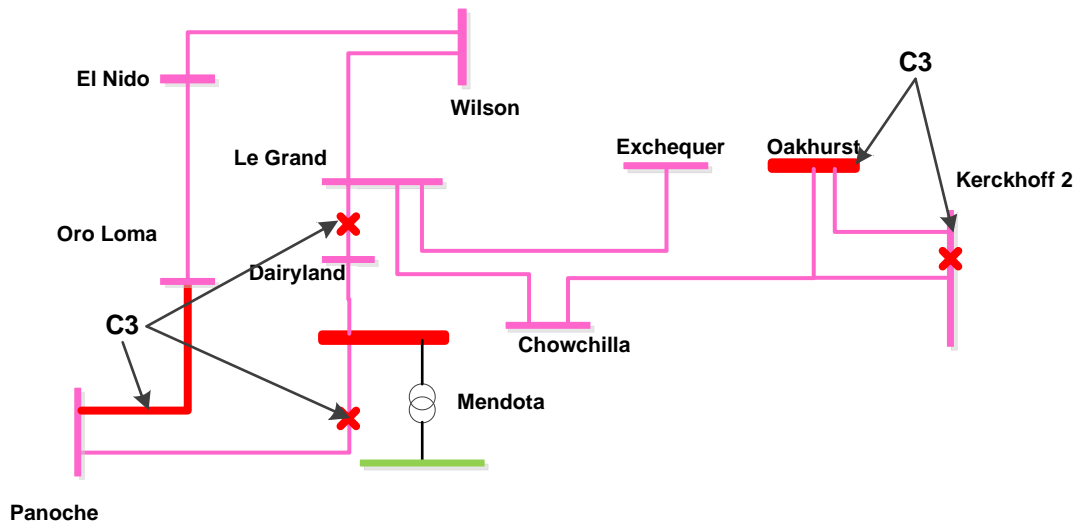
- Panoche-Oro Loma 115kV

■ Voltage Deviation

- Oakhurst 115kV
- Mendota 115kV

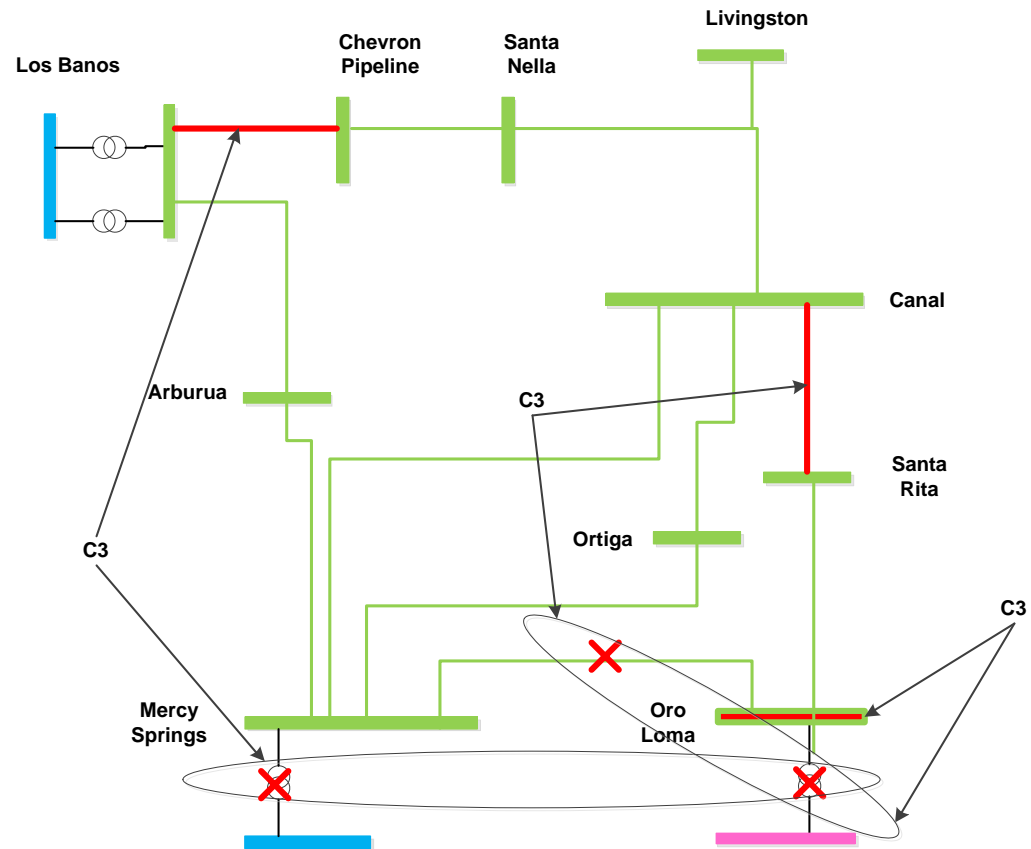
■ Potential Mitigation

- Reconductor Panoche-Oro Loma-Wilson 115kV path
- Reconductor Panoche-Le Grand-Wilson 115kV path
- Install reactive support at Oakhurst 115kV
- Install reactive support at Mendota 115kV
- Second transformer at Oro Loma 115/70kV

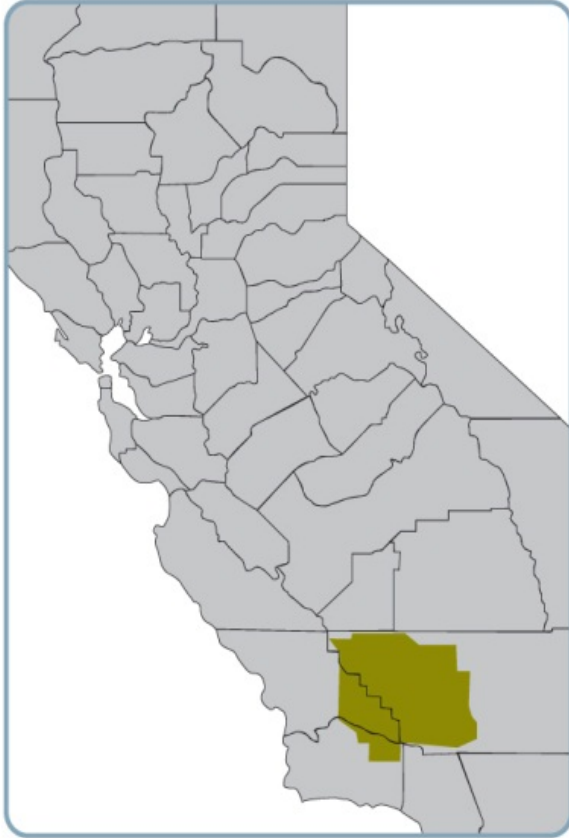


Fresno Area – Results

- Thermal Overloads
 - Oro Loma-Canal #1 70kV
- Voltage Deviation
 - Oro Loma 70kV
- Potential Mitigation
 - Install reactive support at Oro Loma 70kV



Kern Area



- Includes Southern portion of San Joaquin Division
- Generation: Over 3,800 MW of generation
- Comprised of 60, 115, & 230 kV transmission facilities.
- Summer Peak 2,095 MW in 2022

Kern Area Assessment Summary

- The assessment identified:
 - Thermal overloads due to Category B - 3 and Category C - 28
 - Low voltages due to Category A - 1, Category B - 6 and Category C - 7
 - Voltage deviations due to Category B - 7 and Category C - 6
- Compared to last year results:
 - No new Category A problems
 - 4 fewer Category B overloads

Kern Area – Results

■ Thermal Overloads

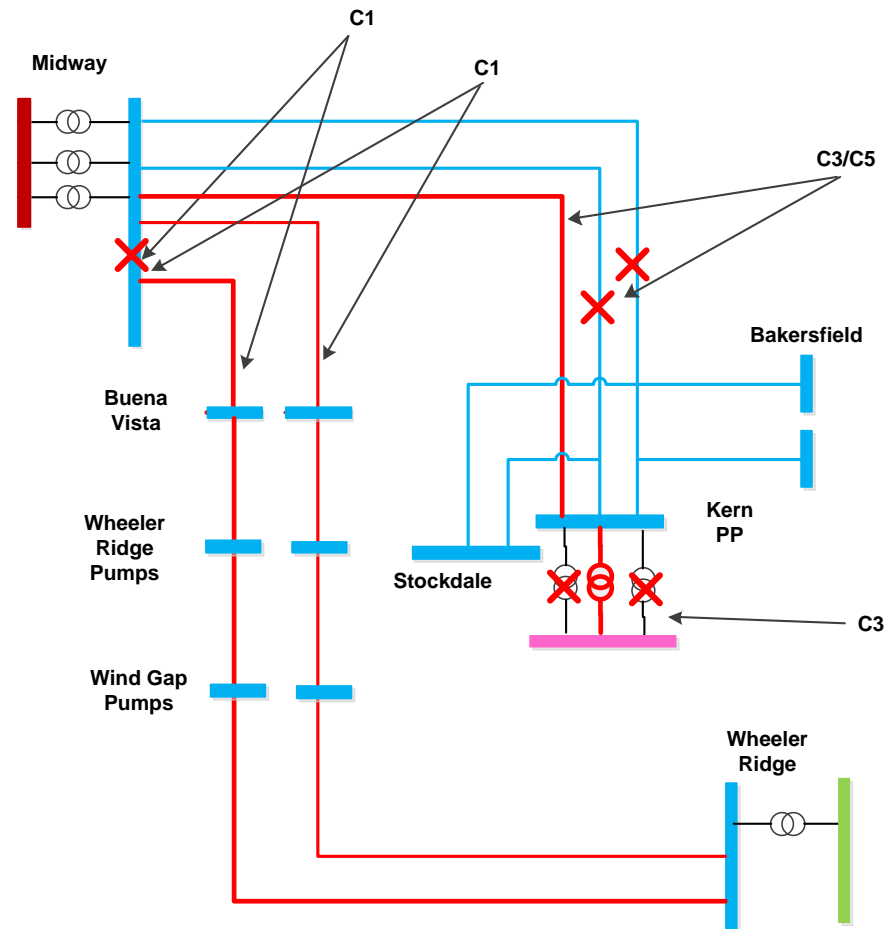
- Midway-Wheeler Ridge #1 & #2 230kV
- Midway-Kern PP #1 230kV

■ Voltage Deviation

- None for the 230kV system in this area

■ Potential Mitigation

- Trip CDWR Pumps
- Reconductor Midway-Kern PP #1 230kV
 - Midway-Kern PP #1, #3 & #4 Capacity Increase are already approved for May 2013 in service, but they were still overloaded in 2017 & 2022.



Kern Area – Results

Thermal Overloads

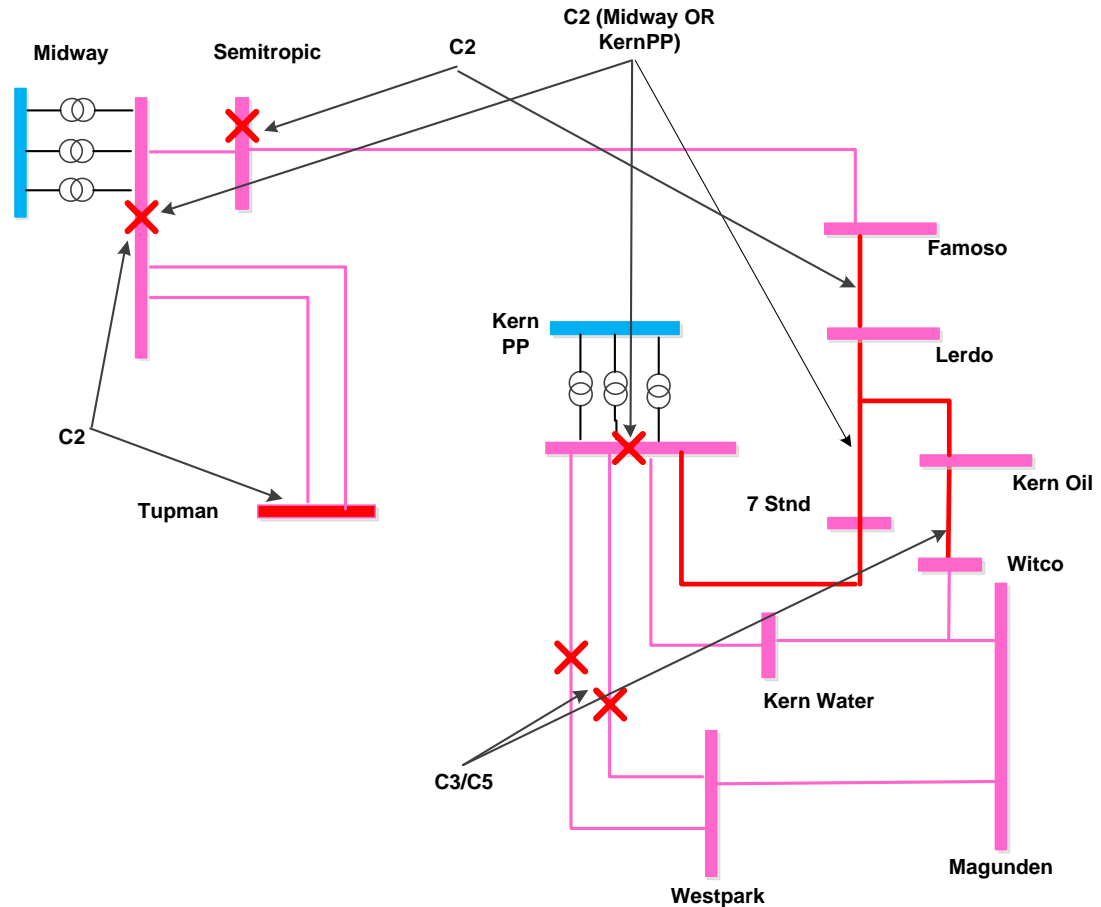
- Kern-Lerdo-Kern Oil 115kV
- Lerdo-Famoso 115kV
- Kern Oil-Witco 115kV

Voltage Deviation

- Wasco 70kV (Not shown)
- Temblor 115kV (Not shown)

Potential Mitigation

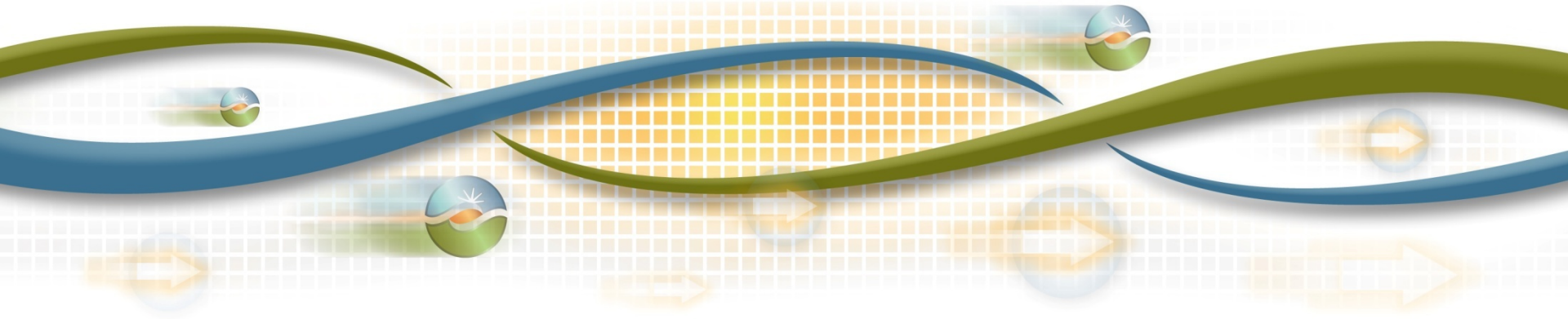
- Reconductor Kern-Lerdo-Kern Oil 115kV
- Reconductor Lerdo-Famoso 115kV
- Reconductor Kern Oil-Witco 115kV
- Add reactive support at Wasco 70kV or upgrade ckt to 115kV
- Add reactive support at Temblor 115kV



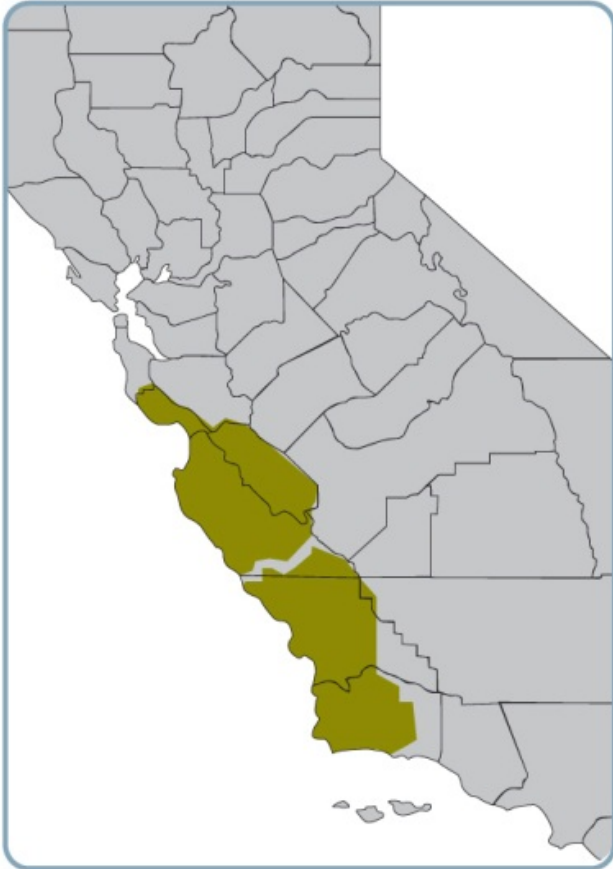
Central Coast and Los Padres Areas Preliminary Reliability Assessment Results

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

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



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
- Transmission system includes 60, 115, 230 and 500 kV facilities
- Winter Peak: 702 MW (peaking occurs in some pockets (e.g., Monterey))
- Summer Peak: 841 MW in 2022

Central Coast Area Assessment Summary

- The assessment identified:
 - Thermal overloads (summer peak) due to Category B – 2, and Category C - 9
 - Thermal overloads (winter peak) due to Category C - 6
 - Low voltages (summer peak) due to Category C -16
 - Low voltages (winter peak) due to Category C - 9
 - Voltage deviations (summer & winter) due to Category B – 1, and Category C - 16
- Compared to last year results:
 - There are no new concerns identified
 - The Watsonville 115 kV Voltage Conversion, Crazy Horse 115 kV Substation and Moss Landing 115/230 kV Bank #1 & 2 Replacement projects mitigate a number of thermal overloads and voltage concerns under Category B and C contingency conditions

Central Coast Area Potential Solutions

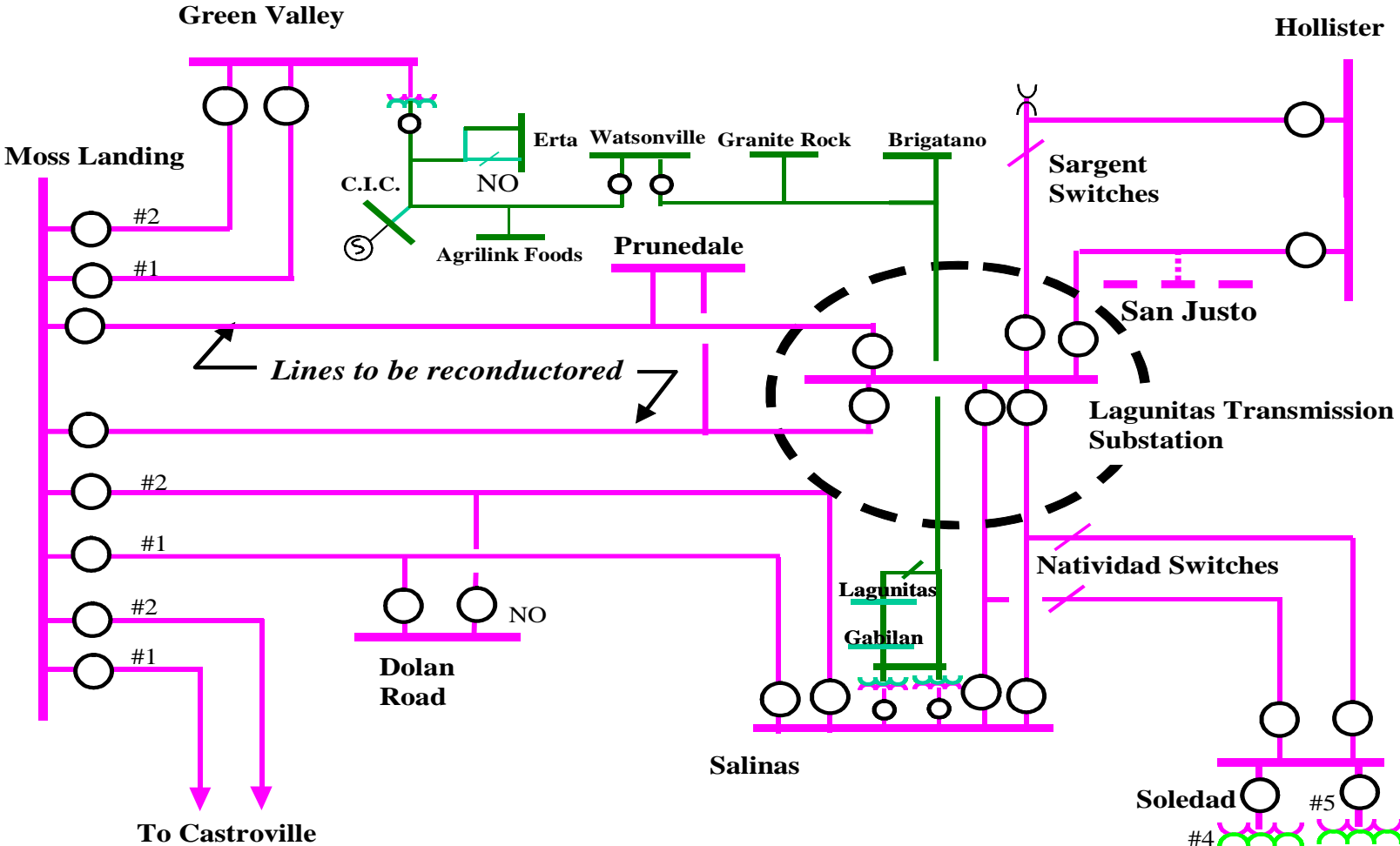
- Potential Mitigation Solutions
 - Operating solutions
 - Interim operating solutions until previously approved projects get implemented
 - Voltage support

Central Coast Area – Results (Category A & B)

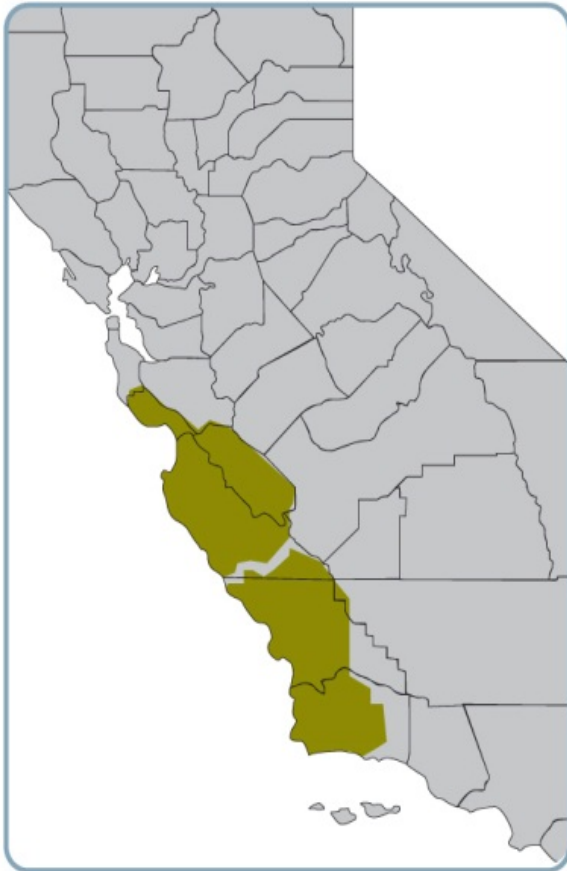
- Thermal Overloads
 - No thermal overloads due to Category A conditions
 - Moss Landing – Green Valley #1 115 kV Line (Cat B / 2014)
 - Moss Landing – Green Valley #2 115 kV Line (Cat B /2014)
 - Mitigation – Interim operating solution until the Watsonville 115 kV Voltage Conversion Project gets implemented
- Low Voltage – None
- Voltage Deviation
 - Hollister 115 kV Substation (Cat B / 2022)
 - Mitigation – Monitor voltage deviation levels

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

Central Coast Area – Results



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 1400 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
- Summer Peak: 641 MW in 2022

Los Padres Area Assessment Summary

- The assessment identified:
 - No thermal overloads due to Category A or B conditions
 - Thermal overloads due to Category C - 4
 - Low voltages due to 23 Category C - 23
 - Voltage deviation due to Category B - 4 and Category C - 26
- Compared to last year results:
 - No new voltage deviations due to Category A or B conditions
 - Last year there were no projects approved in this area

Los Padres Area Potential Solutions

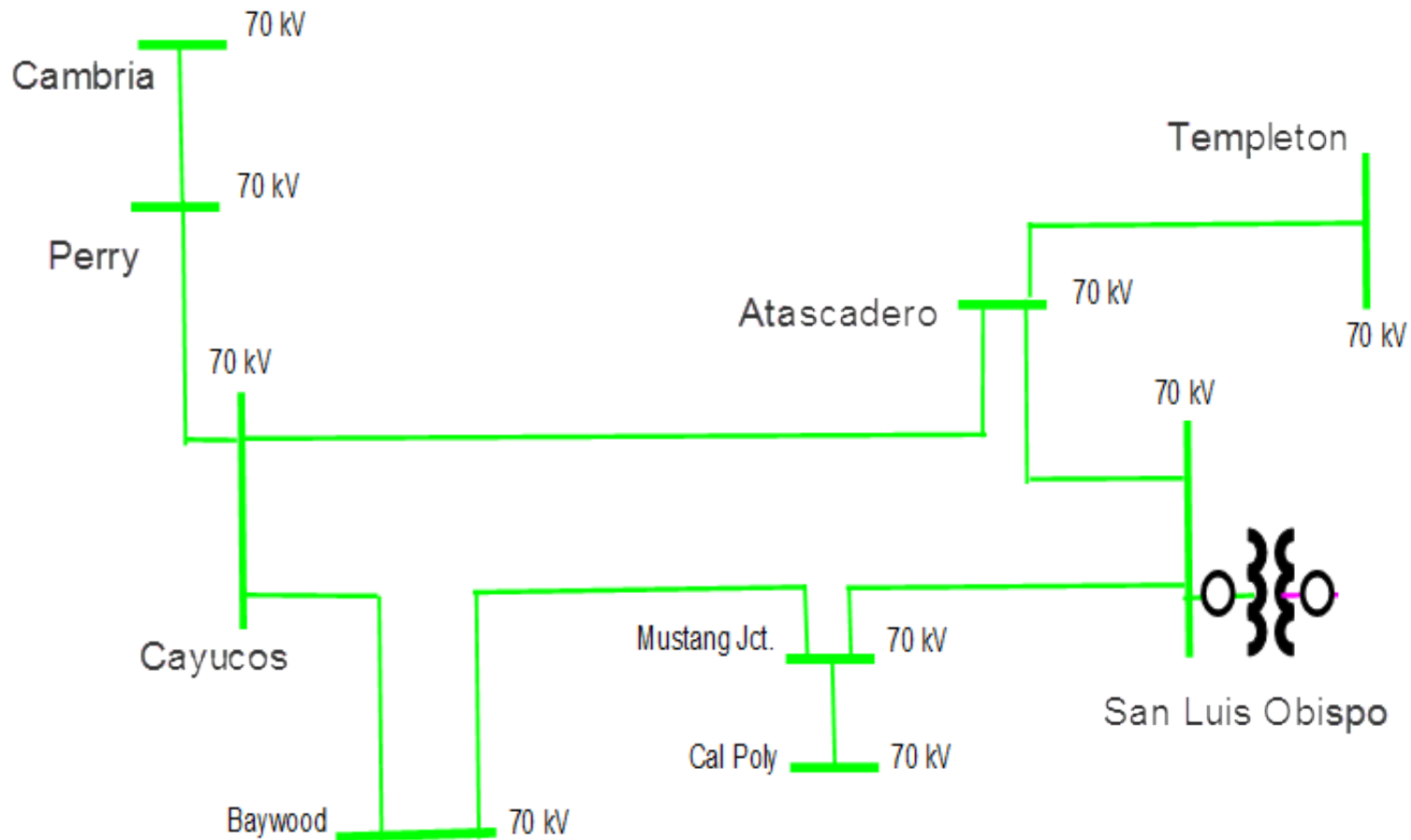
- Potential Mitigation Solutions
 - Operating solutions
 - Install/provide new additional source to the Los Padres area
 - Adjust equipment voltage settings
 - Voltage support
 - Monitor voltage conditions

Los Padres Area – Results (Category A & B)

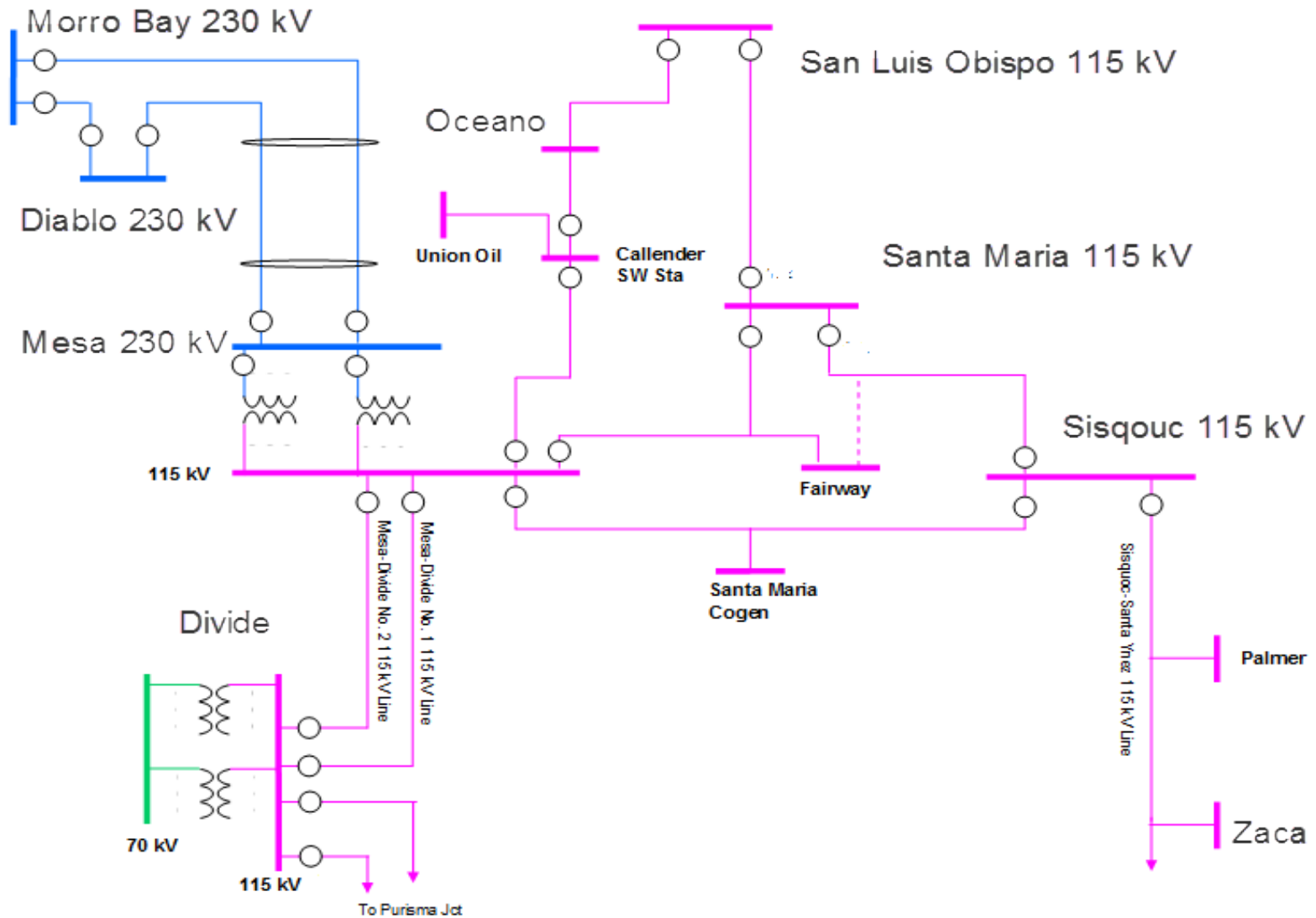
- Thermal Overloads
 - No thermal overloads due to Category A or B conditions
- Low Voltage – None
- Voltage Deviation
 - VAFB SSA 70 kV Substation (Category B / 2014 through 2022)
 - Mitigation – Reactive support
 - Cholame 70 kV Substation (Category B / 2022)
 - Mitigation – Monitor voltage deviation level
 - Paso Robles 70 kV Substation (Category B / 2014, Non-Peak)
 - Mitigation – Adjust equipment voltage settings
 - Divide 70 kV Substation (Category B / 2014)
 - Mitigation – Adjust equipment voltage settings

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

Los Padres Area – Results



Los Padres Area – Results



Central California Study Area Preliminary Reliability Assessment Results

Catalin Micsa

Lead Regional Transmission Engineer

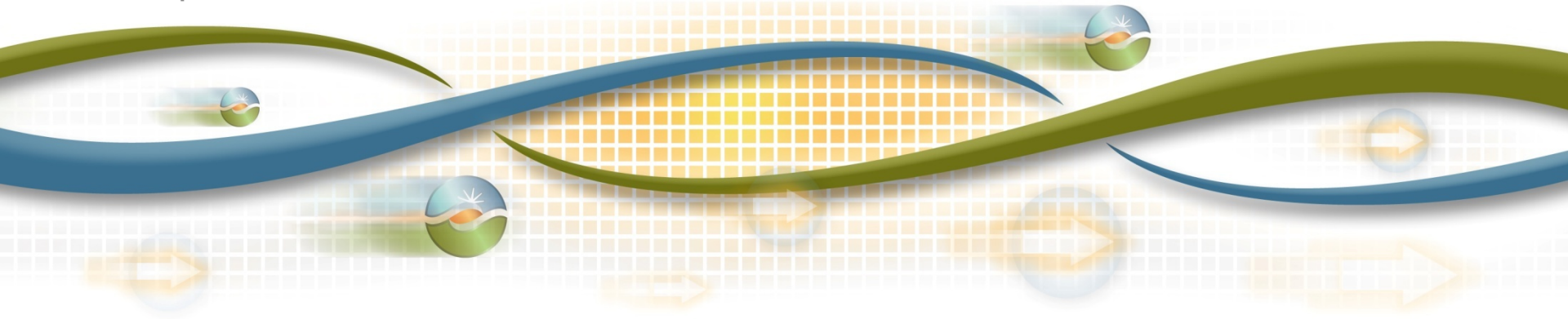
Studies Performed By:

Irina Green – Regional Transmission Engineering Lead

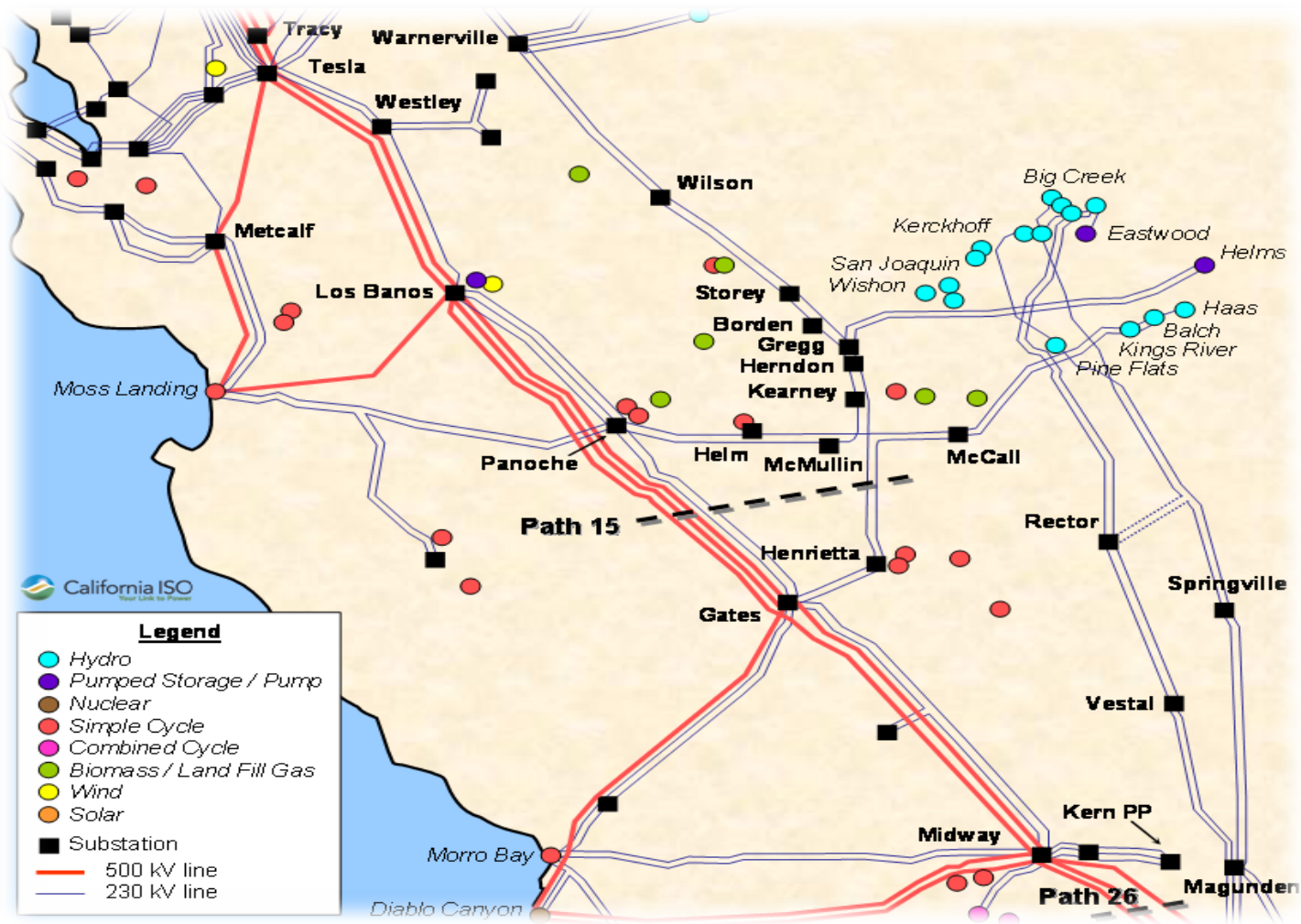
Joseph E Meier – Senior Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting

September 26-27, 2012



Central Valley Study Area



Central Valley Study Area Assessment Cases

- The study used:
 - All assessment cases related to the Bulk and Fresno/Kern areas
 - Four 2017 scenarios – per addendum to study plan
 - Four 2022 scenarios – per addendum to study plan
- Results:
 - See Bulk as well as and Fresno and Kern assessment
 - 2017 scenarios – *results presented here*
 - 2022 scenarios – *results presented later in the year*
 - Only additional or more severe concerns compared to the ones reported in the 2012-2013 Transmission Plan Reliability Assessment studies are discussed

2017 Summer Peak – Dry Hydro Scenario

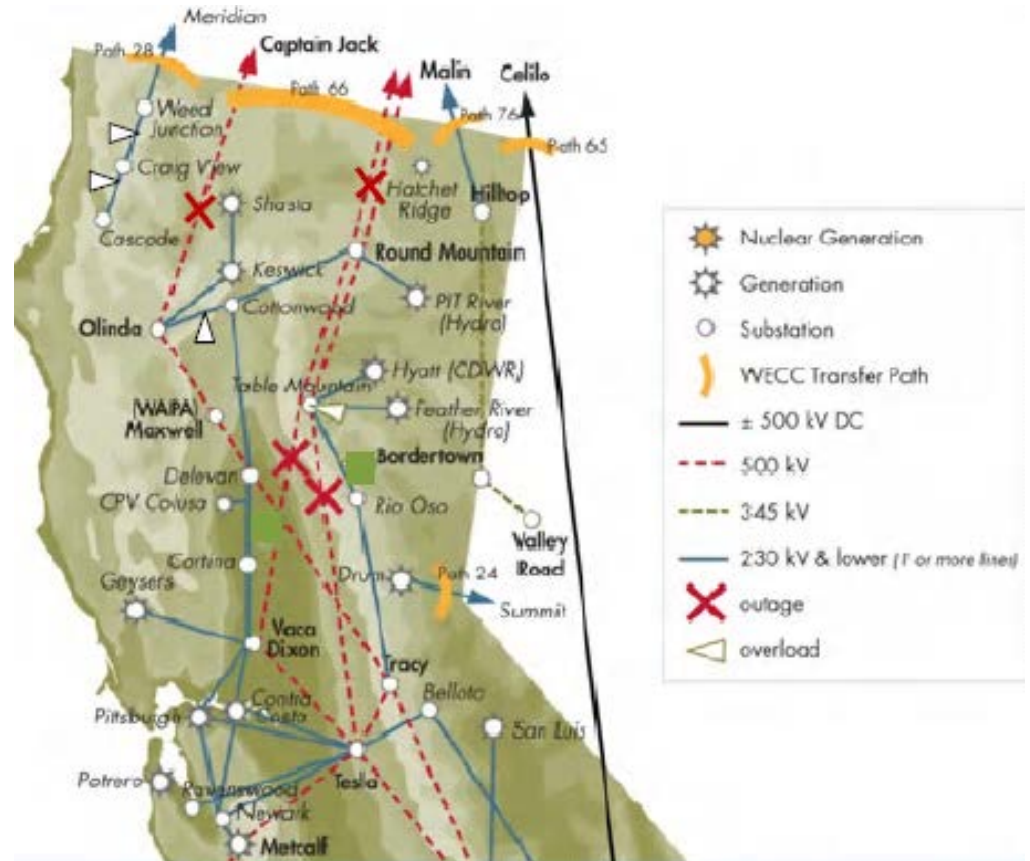
- Base case parameters:
 - Northern Cal Hydro – dry year historical data
 - Path 15 stressed at maximum per dry year historical data for peak hours (850 MW North-to-South)
 - Path 66 stressed at maximum per dry year historical data for peak hours (4700 MW North-to-South)
 - North of Los Banos at 1100 MW North-to-South flow
 - Helms generating with three units
- Results:
 - North of Los Banos not a limiting concern
 - LCR studies to be performed at a later date

2017 Summer Peak – Dry Hydro Scenario Study Results Northern PG&E System

- Table Mountain 500/230 kV transformer – Category C overload
- Caused by insufficient generation from Feather River (dry hydro year)

Potential Mitigation

- Modify RAS or upgrade
- Congestion management

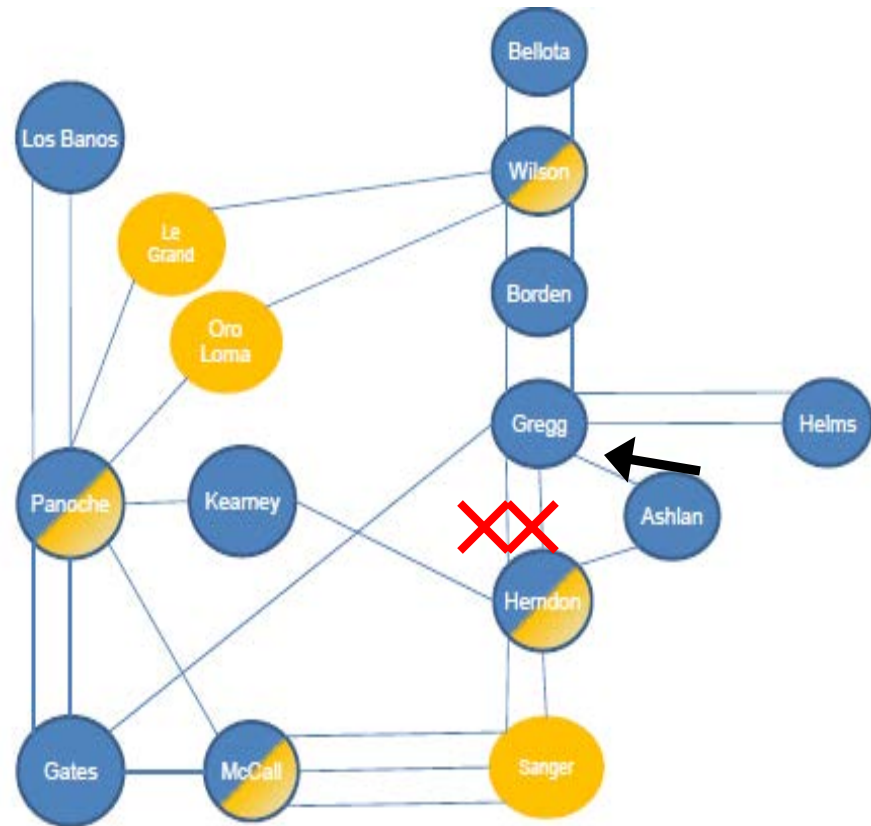


2017 Summer Peak – Dry Hydro Scenario Study Results Southern PG&E System

- Gregg-Ashlan 230 kV – Category C overload
- All Helms units assumed to be tripped with the outage
- Caused by low King River generation

Potential Mitigation

- Ashlan-Gregg and Ashlan-Herndon 230 kV Line reconductor – ISO approved
- prior to upgrade – operational procedure to open Ashlan-Herndon line



✗ outage
➔ overload

2017 Summer Partial Peak – Dry Hydro Scenario

- Base case parameters:
 - Northern Cal Hydro – dry year historical data
 - Path 15 modeled according to dry year historical data for partial peak hours (25 MW South-to-North)
 - Path 66 stressed at maximum per dry year historical data for partial peak hours (4350 MW North-to-South)
 - North of Los Banos flow modeled at 800 MW North-to-South
 - Helms Off-line
- Results:
 - Normal overload on Warnerville-Wilson 230 kV line mitigated by dispatching Fresno internal peaking resources
 - Normal overload on Bellota-Warnerville 230 kV line mitigated by dispatching Fresno internal peaking resources

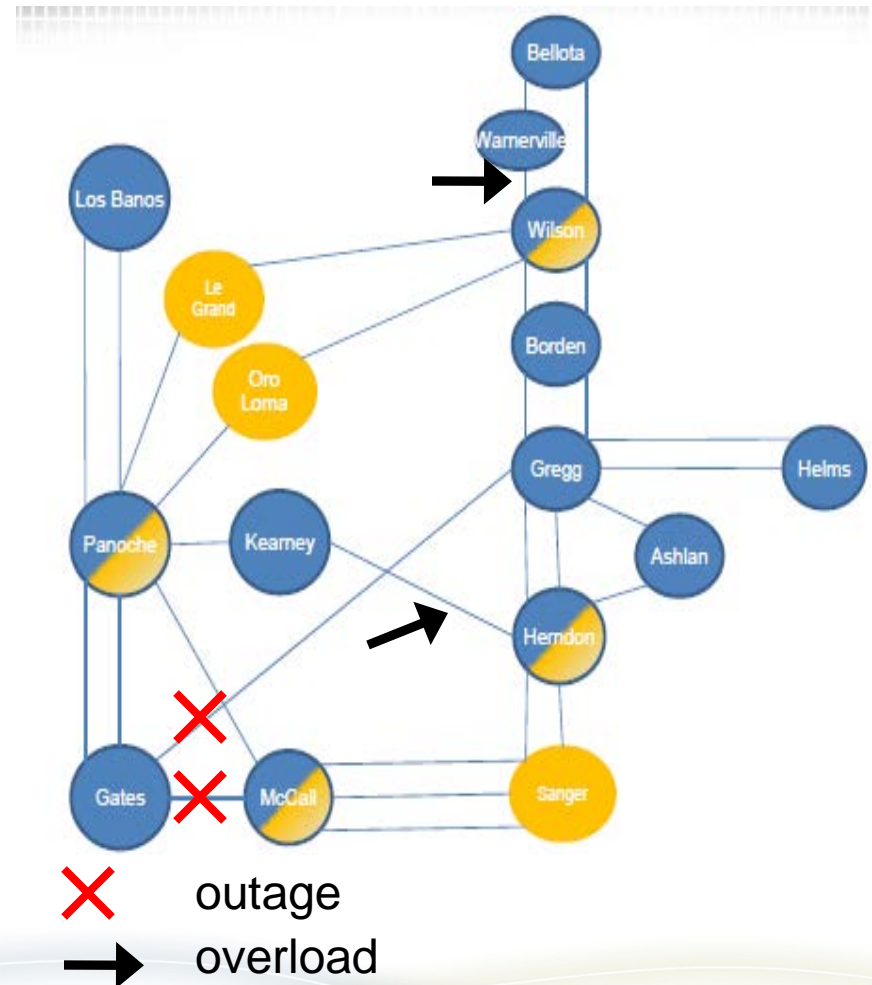
2017 Summer Partial Peak – Dry Hydro Scenario Study Results

- Warnerville-Wilson 230 kV line overload - Category A, B & C
 - Kearney-Herndon 230 kV line overload – Category C
 - GWF-Kingsburg 115 kV line overload – Category C
 - McCall-Sanger #3 115 kV line overload – Category C
 - Manchester-Airways-Sanger 115 kV line overload – Category C
 - Wilson-Oro Loma 115 kV line overload – Category C
- Caused by low hydro generation in Fresno (with Helms off-line)

Potential Mitigation:

- Congestion management

✗ any 500 kV line between Tracy & Los Banos



2017 Fall/Winter Off-Peak – Dry Hydro Scenario

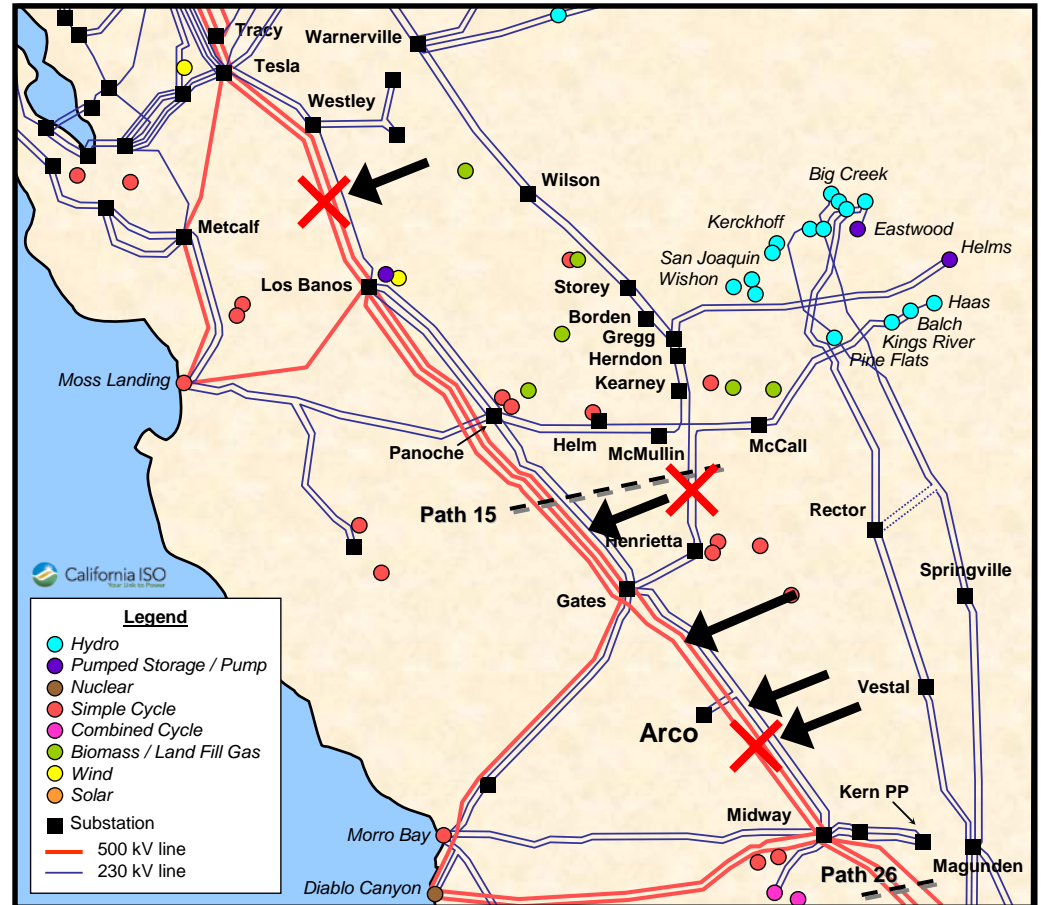
- Base case parameters:
 - Northern Cal Hydro – dry year historical data
 - Path 15 stressed at maximum (5400 MW South-to-North)
 - Path 66 modeled according dry year historical data for off-peak hours (1140 MW South-to-North)
 - PDCI at 1850 MW South-to-North
 - Helms pumping with two pumps
- Results:
 - Midway-Gates 500 kV line loaded to 101% under normal conditions
 - Emergency overloads on 230 kV in Central California

2017 Fall/Winter Off-Peak – Dry Hydro Scenario Study Results

- Gates-Midway 500 kV line loaded at 101% - Category A
- Gates-Midway 230 kV and Arco-Midway 230 kV line overload - Category B & C
- Westley-Los Banos 230 kV line overload – Category C
- Panoche-Gates #1&2 230 kV lines overload – Category C
- Kerney-Herndon 230 kV line overload – Category C
- Gates-Gregg 230 kV line overload – Category C

Potential Mitigation:

- Congestion management including Path 15 flow reduction
- Further mitigation under review



X outage
➔ overload

2017 Spring Off-Peak – Wet Hydro Scenario

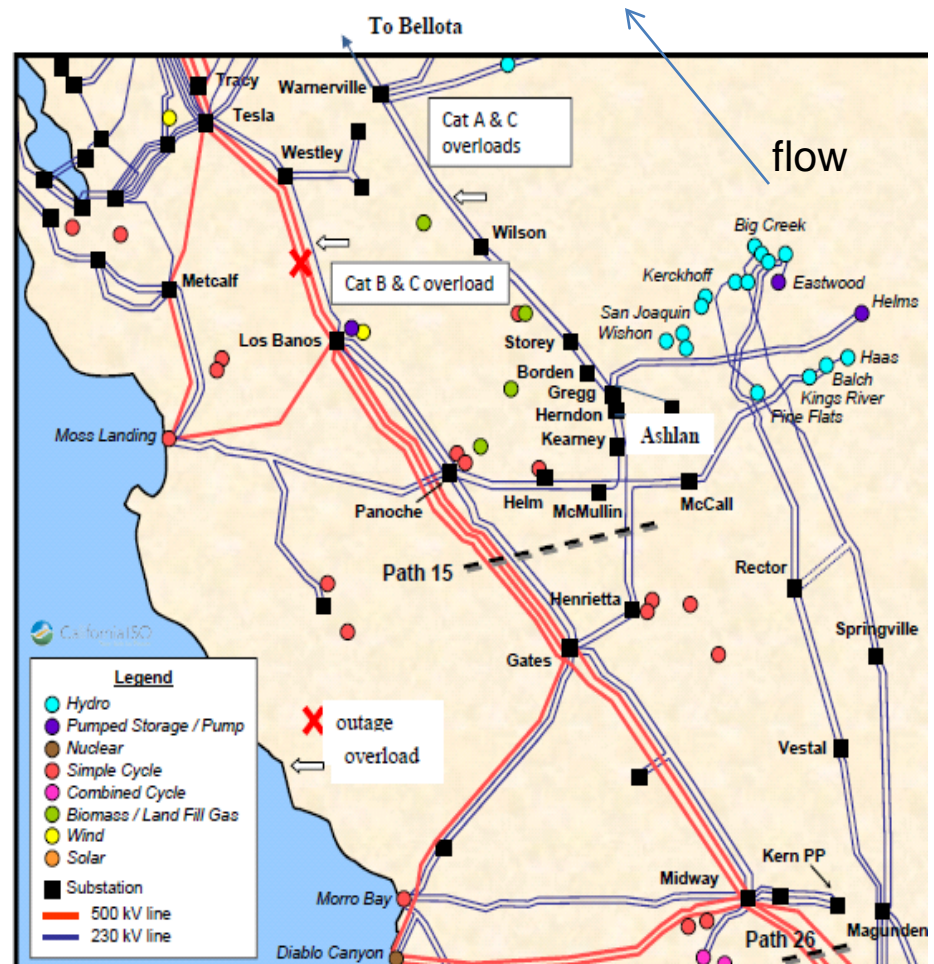
- Base case parameters:
 - Northern Cal Hydro – wet year historical data
 - Path 15 slightly below the max historical data for a wet year during off-peak hours (3600 MW South-to-North)
 - Path 66 slightly above the max historical data for a wet year during off-peak hours (1400 MW South-to-North)
 - PDCI at 1850 MW South-to-North
 - Helms generating with three units
- Results:
 - Warnerville-Wilson 230 kV line limits the Fresno resource output as well as Path 15 flows

2017 Spring Off-Peak – Wet Hydro Scenario Study Results

- Warnerville-Wilson 230 kV line – Category A (100% loading) overload Category C
- Westley-Los Banos 230 kV line overload – Category B & C
- Borden-Gregg 230 kV line overload – Category C
- Storey-Borden 230 kV line overload – Category C

Potential Mitigation:

- Congestion management including Path 15 flow reduction
- Further mitigation under review



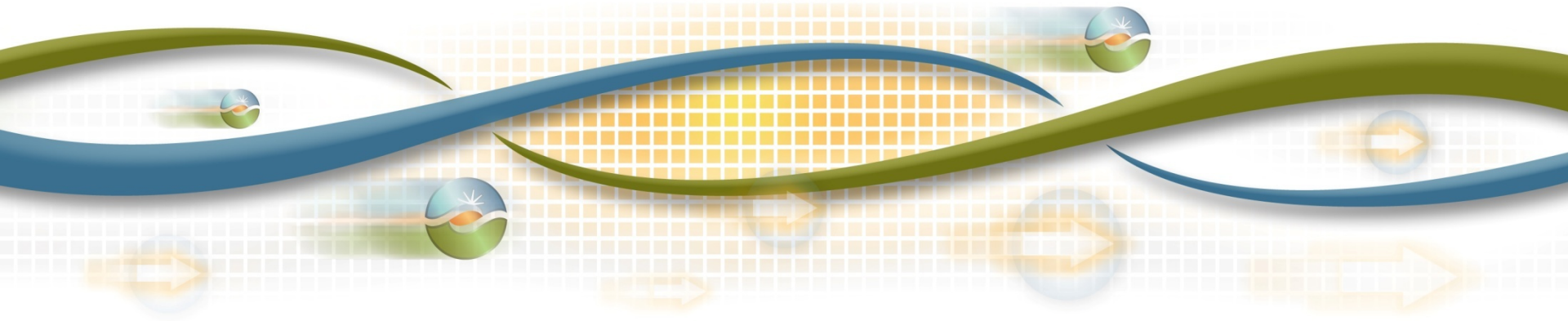
Remaining assessment activities

Reliability Assessment Activity	Due Date:
Present 2017 results at the stakeholder meeting	Sept 26-27 2012
Perform sensitivity studies on 2017 and 2022 cases	Nov 15 2012
Post final study results	Dec 4 2012
Present results at the stakeholder meeting	Dec 11-12 2012
Economic Assessment Activity	Due Date:
Modify Database to include “2012 renewable data”	Sept 20 2012
Perform economic studies and sensitivities	Nov 20 2012
Post economic study results	Dec 4 2012
Present results at the stakeholder meeting	Dec 11-12 2012
Overall Activity	Due Date:
Draft Plan for Stakeholder Comment	Jan 31 2013

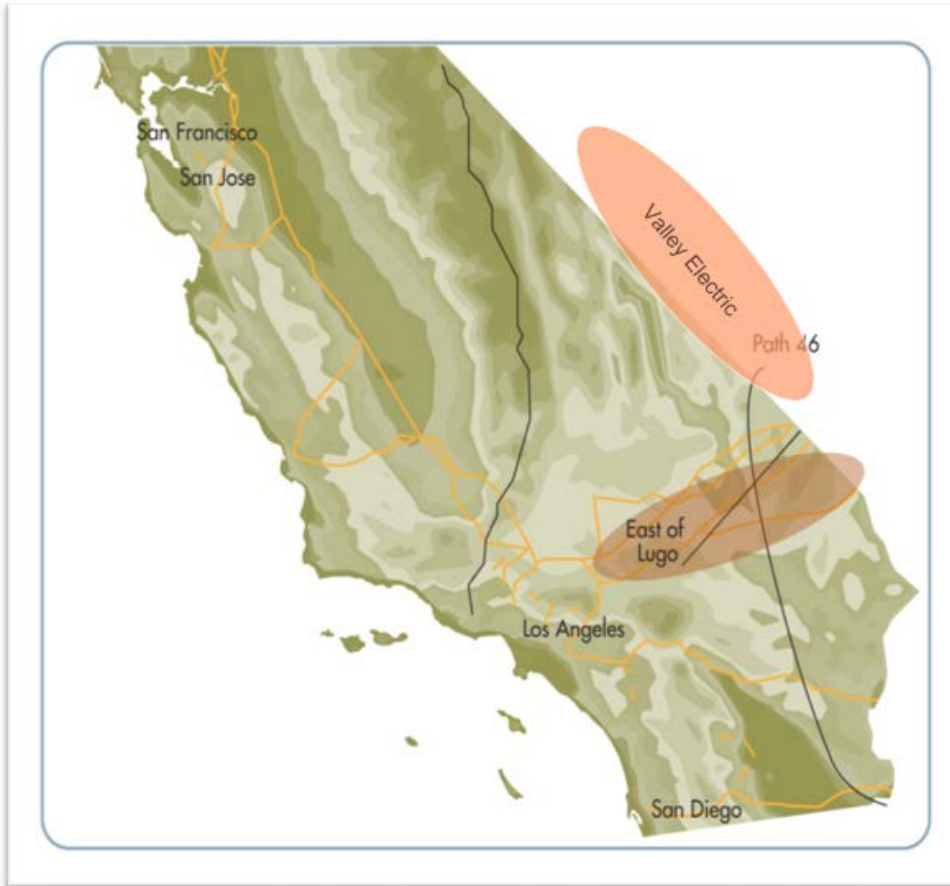
Valley Electric Area Preliminary Reliability Assessment Results

Frank Chen
Sr. Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



Valley Electric Area



- Includes Amargosa, Sandy, Pahrump, Gamebird, Vista, Valley, Beatty, etc. substations
- Generation Modeled:
 - 0 MW in 2014
 - 750 MW renewables modeled in 2022
- Comprised of 138, 230 KV transmission facilities.
- Summer Peak load of 121 MW in 2014

Valley Electric Area Assessment Summary

- The assessment identified:
 - 11 branches overloaded due to Category B & C outages
 - 33 buses with voltage concern for Category B & C outages
 - Area load flow diverged due to Category C outages
 - 2 Transient stability concerns due to Category C outages
 - 29 buses with post-transient voltage concern for Category C outage
- Compared to last year results:
 - None comparison

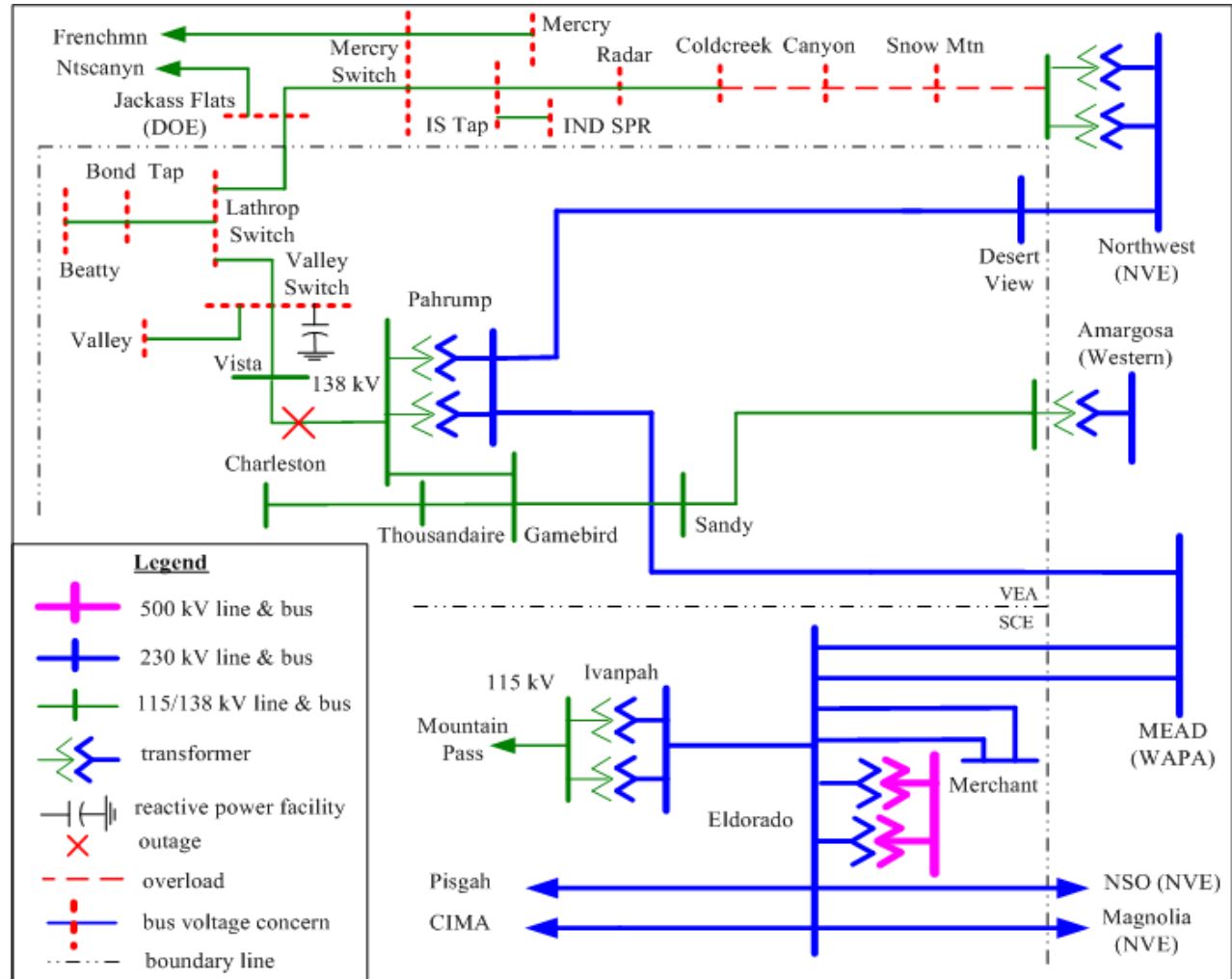
Valley Electric Area Potential Solutions

■ Potential Mitigation Solutions

- 1) OP to mitigate interim Category B overloads
- 2) Re-arrange 138 kV line bay positions at Vista and Pahrump subs
- 3) Consider to adopt higher N-1 voltage deviation criteria (7%)
- 4) Work with WAPA to adjust NLTC of Amargosa 230/138 kV bank
- 5) Add VAR support and/or improve power factor of distribution
- 6) Develop high emergency ratings for Pahrump 230/138 kV banks
- 7) Review existing UVLS to cover Category C low voltage issues
- 8) OP to lock LTC of Pahrump banks to avoid high voltage damage
- 9) OP to operate VEA 138 kV system radially for Category C issues
- 10) Modify previously proposed gen tripping SPS in VEA and SCE

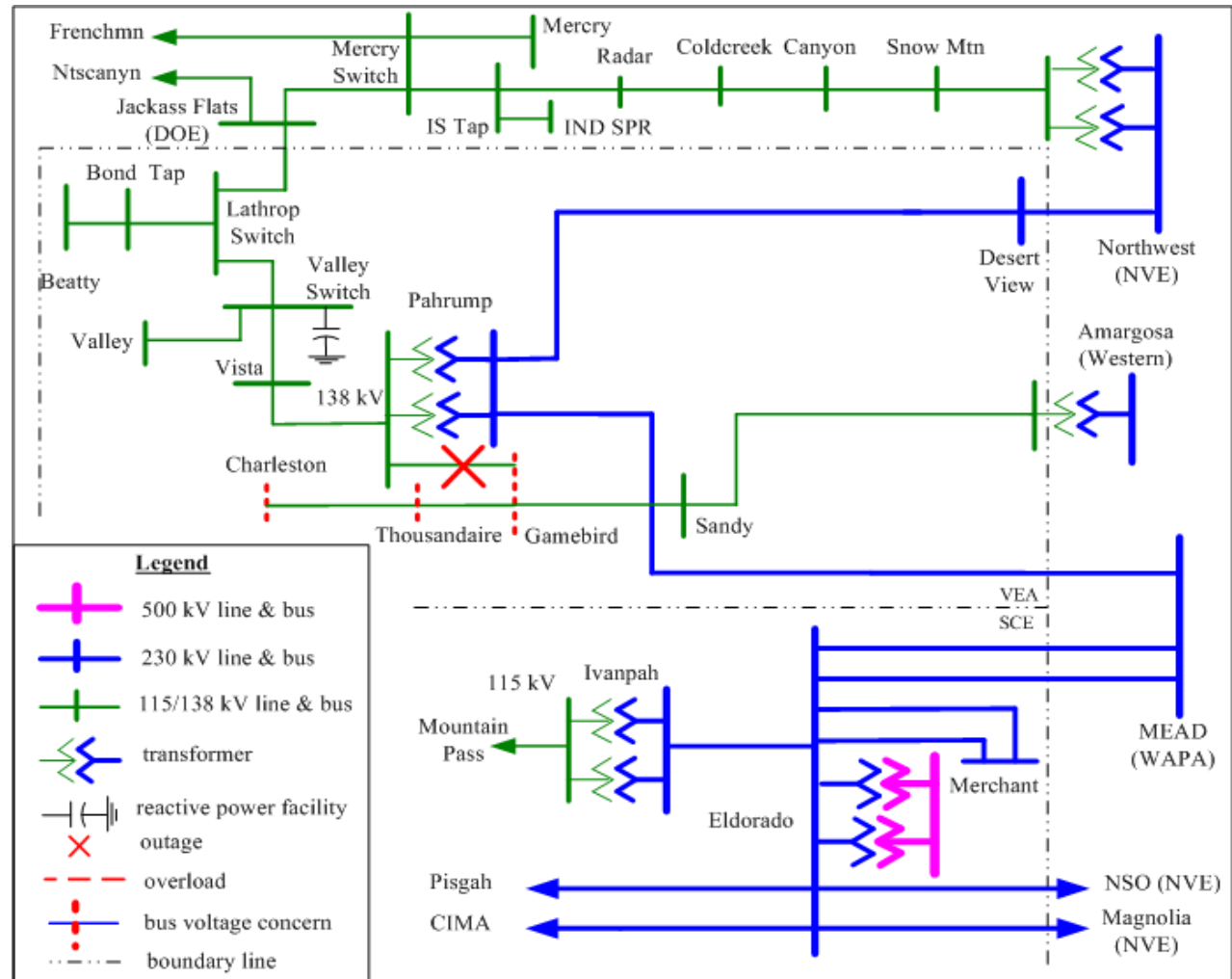
Valley Electric Area – N-1 Issue (1)

- Thermal overload
Nwest-Cold Creak 138 kV lines (2014)
- Voltage deviation
Over 5% in Northern VEA & neighboring NVE 138 kV systems (2014)
- Potential Mitigation
 - 1) Shed 2 MW of load until Charleston-Vista line in service, or discuss with NVE to develop emergency rating
 - 2) consider higher voltage deviation criteria (7%), and improve PF or add VAR support



Valley Electric Area – N-1 Issue (2)

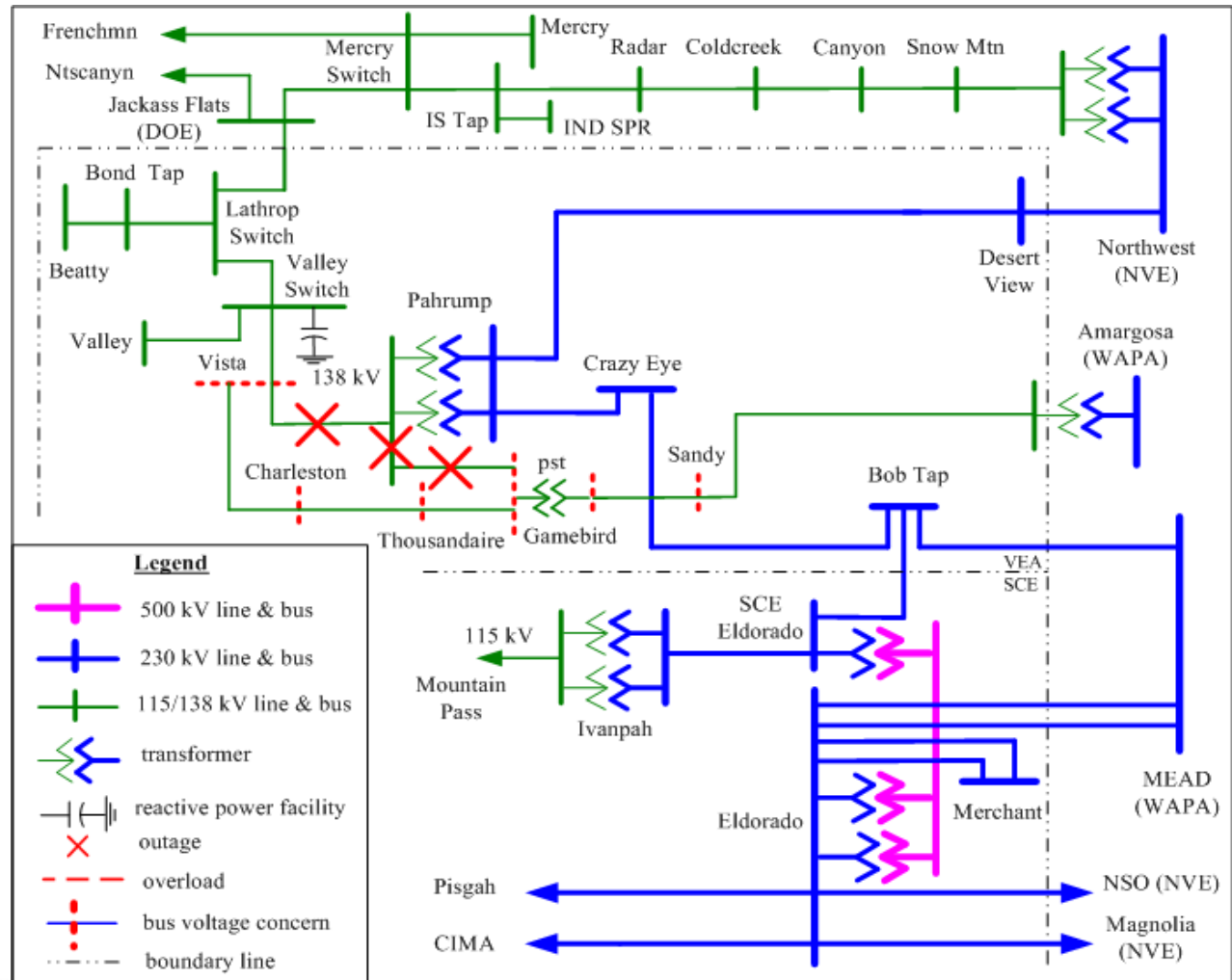
- Voltage concerns
Voltage under 0.9 pu and over 10% voltage drop on Gamebird, Thousandaire, Charleston 138 kV buses (2014)
- Potential Mitigation
 - 1) Work with WAPA to adjust NLTC of Amargosa 230/138 kV transformer, and
 - 2) Improving PF or adding VAR support



Valley Electric Area – Breaker Failure (1)

- Voltage deviation
Over 10% voltage drop on Sandy, Gamebird, Vista, Thousandaire, Charleston 138 kV buses (2017/2022)

- Potential Mitigation
Re-arrange the two 138 kV lines bay positions @ Pahrump



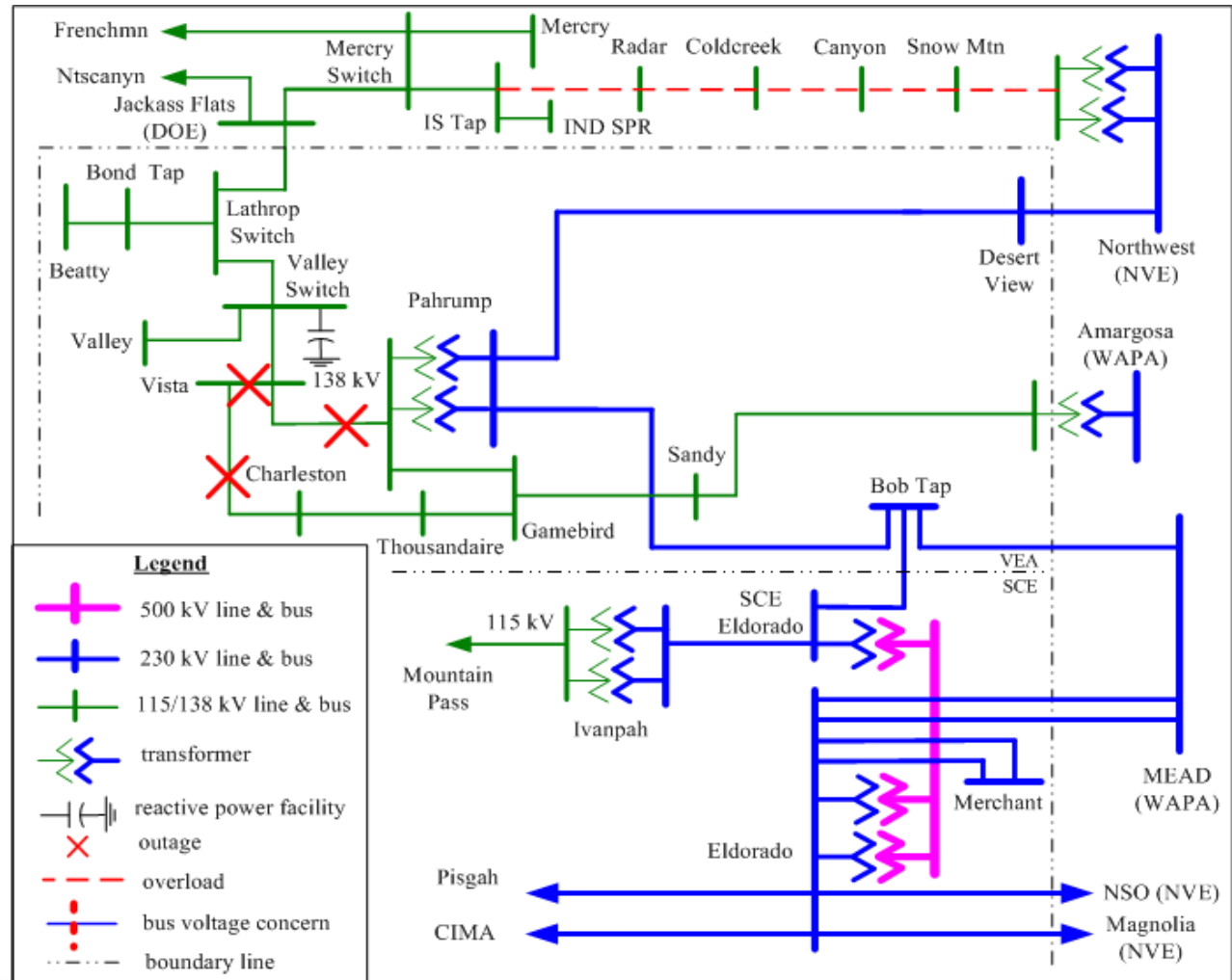
Valley Electric Area – Breaker Failure (2)

- Overload

Nwest-Snow MTN-
Canyon-Cold Creak-
Radar-IS Tap 138 kV
lines (2017)

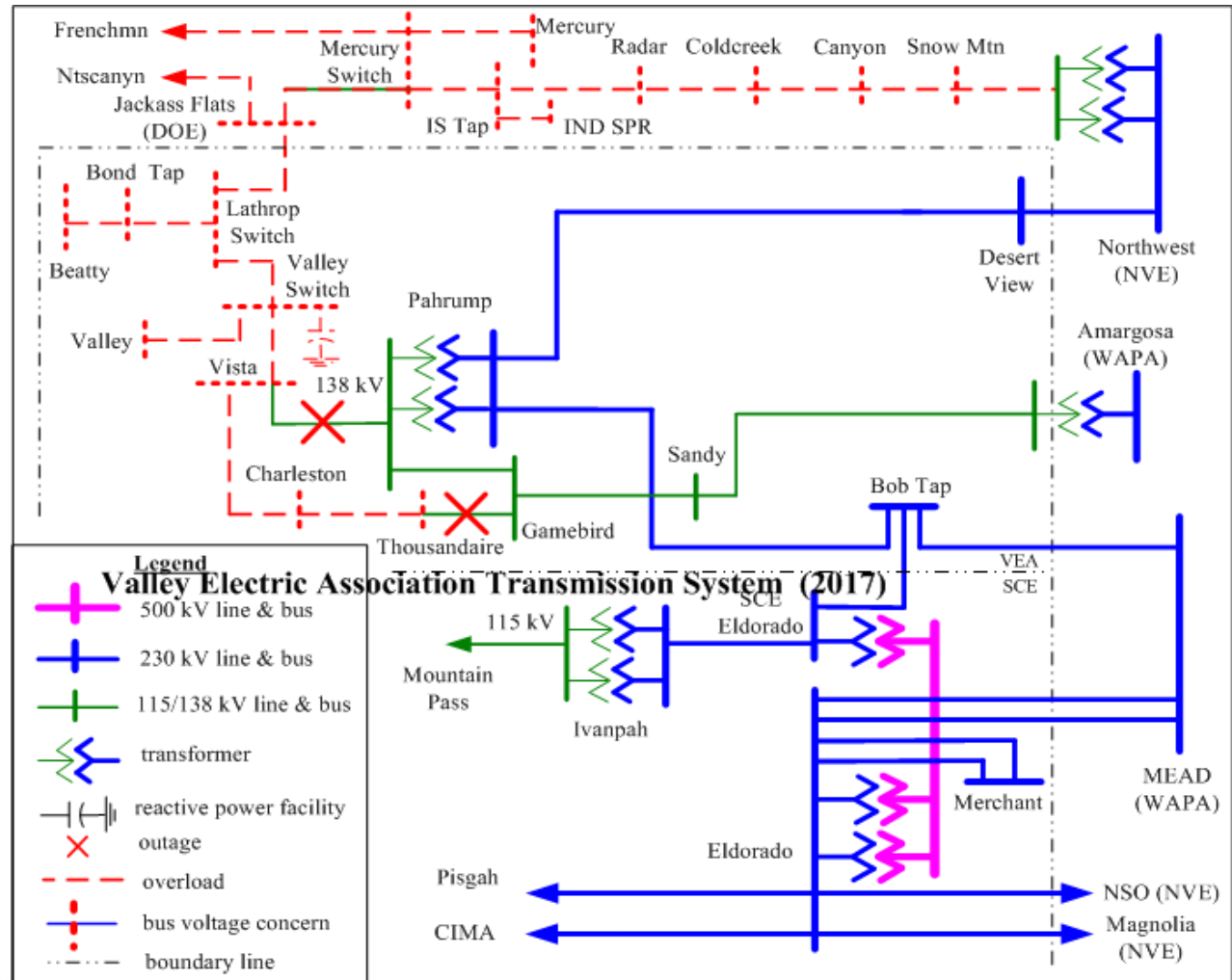
- Potential Mitigation

Re-arrange the two
138 kV lines bay
positions @ Vista



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

- Power Flow diverged (2017/2022)
- Potential Mitigation
 - 1) Review UVLS, or
 - 2) Develop OP to manually open 138 kV tie with DOE at Lathrop after 1st L-1



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

- Overload

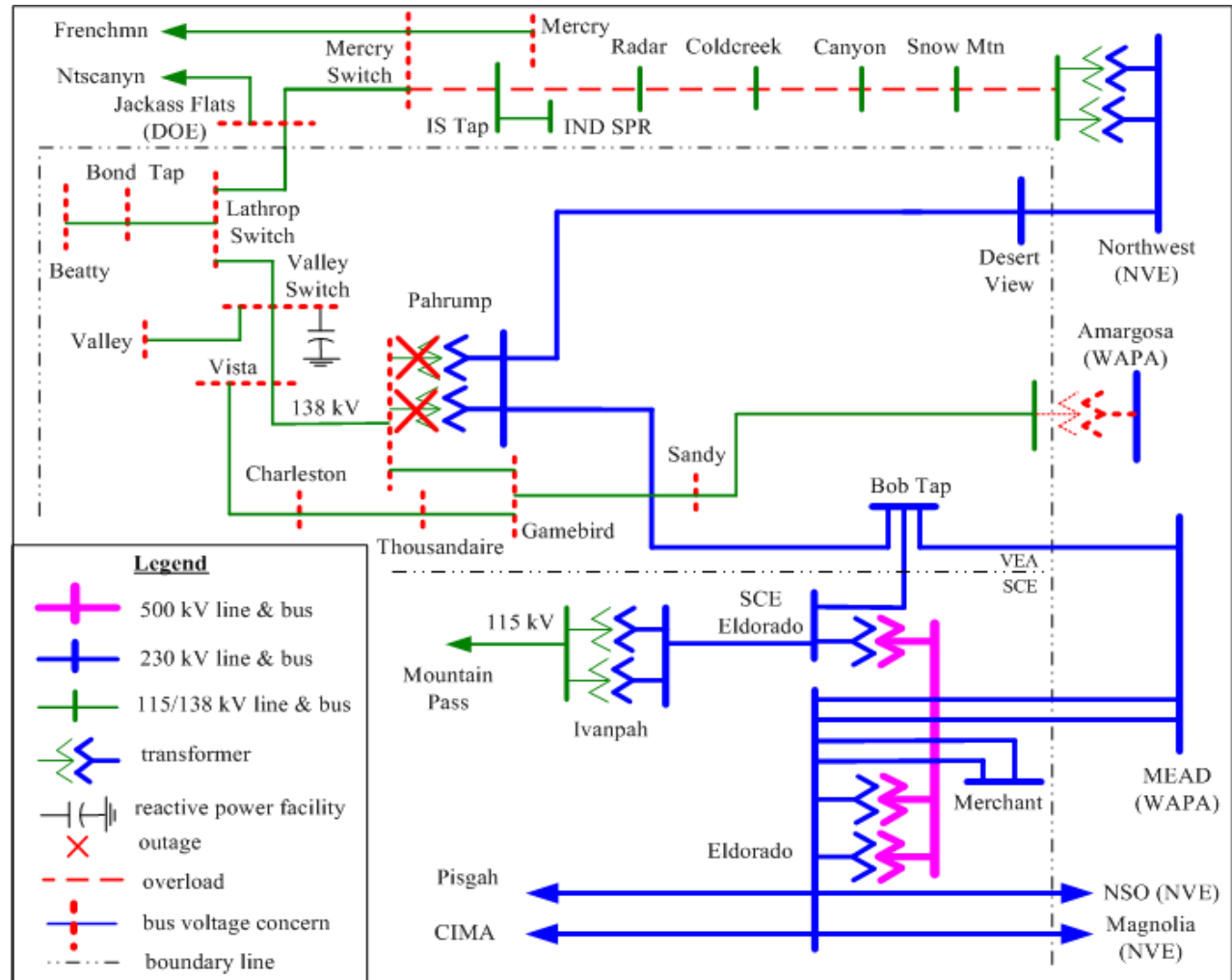
Nwest-Mercury 138 kV lines & Amargosa bank (2014/17), load flow diverged (2022)

- Voltage concerns

Northern VEA & vicinity NVE 138 kV areas (2014/17/22)

- Potential Mitigation

Develop OP to operate VEA 138 kV system radially after 1st outage



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

Overload

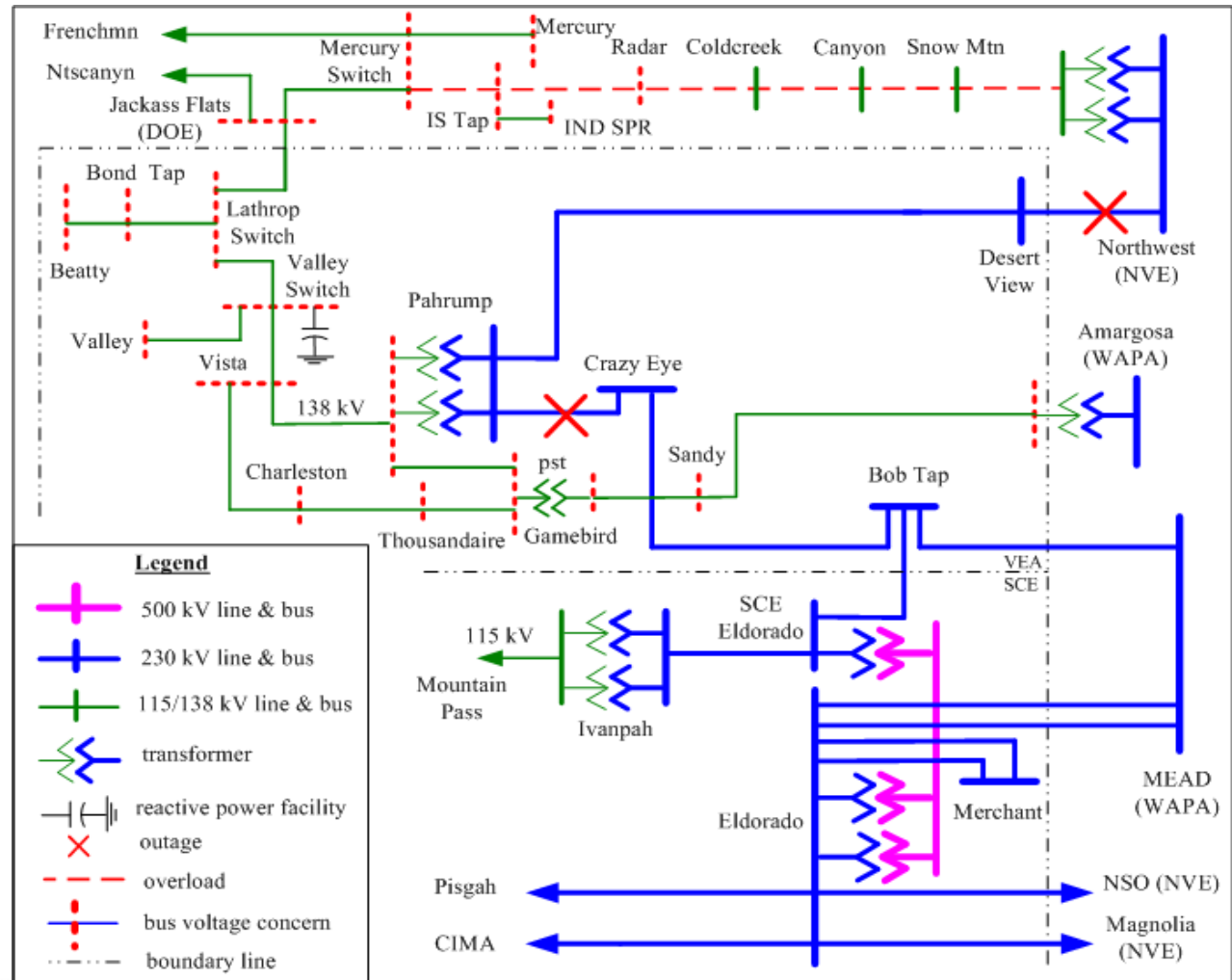
Nwest-Mercury 138 kV lines (2014/17/22)

Voltage concerns

Northern VEA & vicinity NVE 138 kV areas (2014/17/22)

Potential Mitigation

Develop OP to operate VEA 138 kV system radially after 1st outage



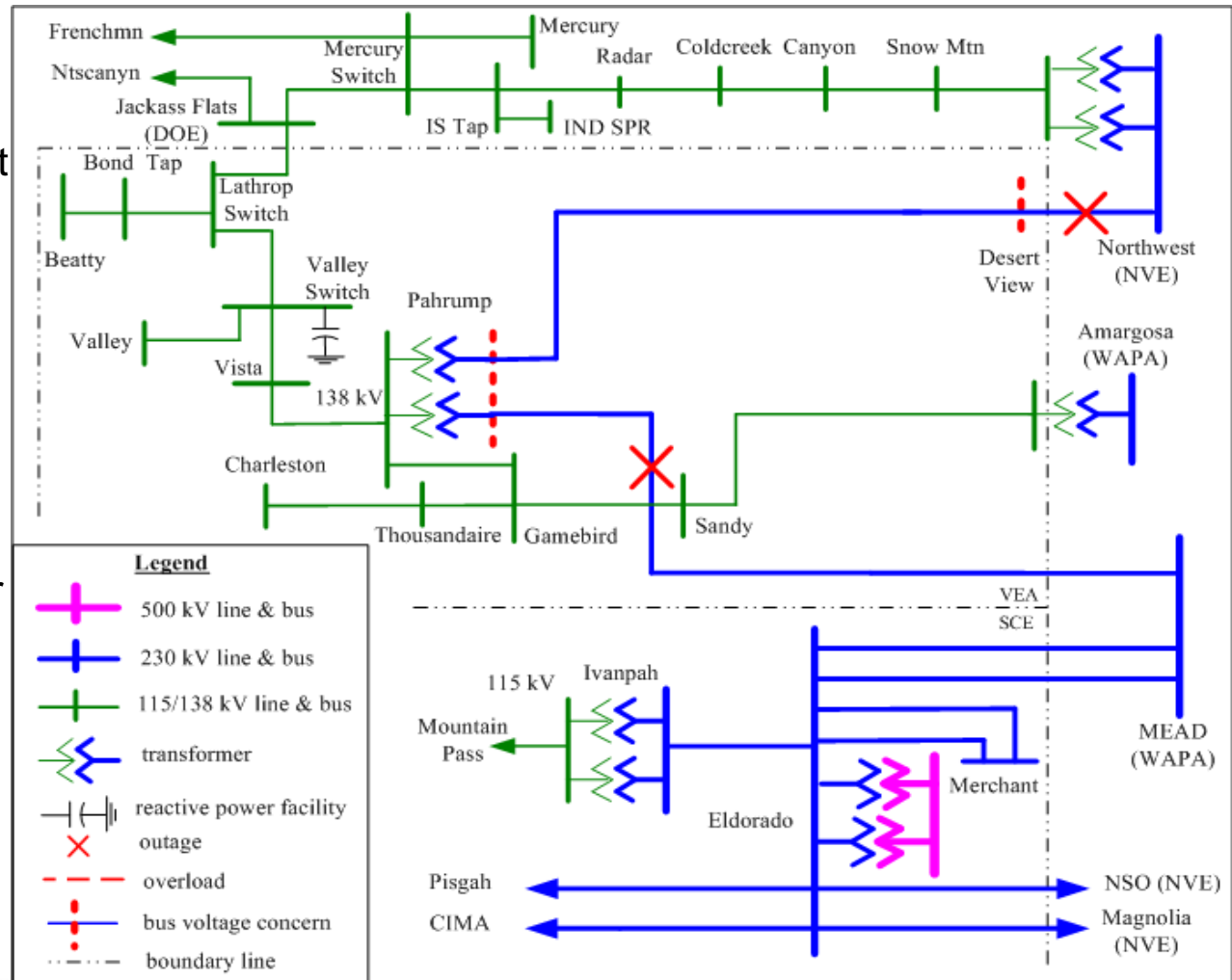
Valley Electric Area – N-1-1 issue (4)

- Voltage concerns

19.6/15.8% voltage jump and as high as 1.18/1.16 pu voltages at Desert View/Pahrump 230 kV buses (2014 Summer Light)

- Potential Mitigation

Develop OP to lock LTC at Pahrump 230/138 kV banks after 1st outage



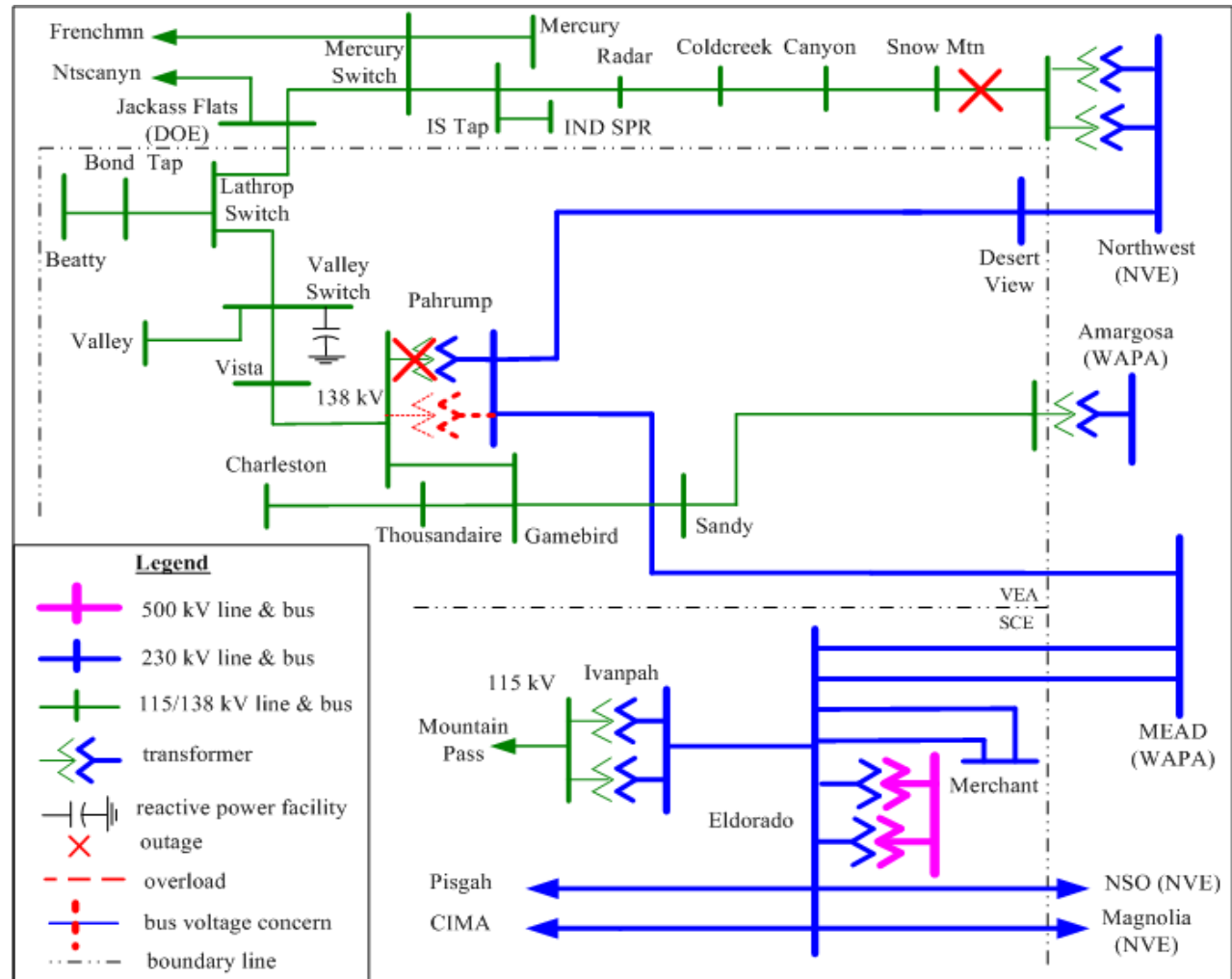
Valley Electric Area – N-1-1 issue (5)

Overload

As high as 121% of Pahrump 230/138 kV bank emergency rating (2014/17)

Potential Mitigation

- 1) Develop higher emergency rating for Pahrump 230/138 kV banks, or
- 2) Work with NVE to shed loads in the neighboring 138 kV system



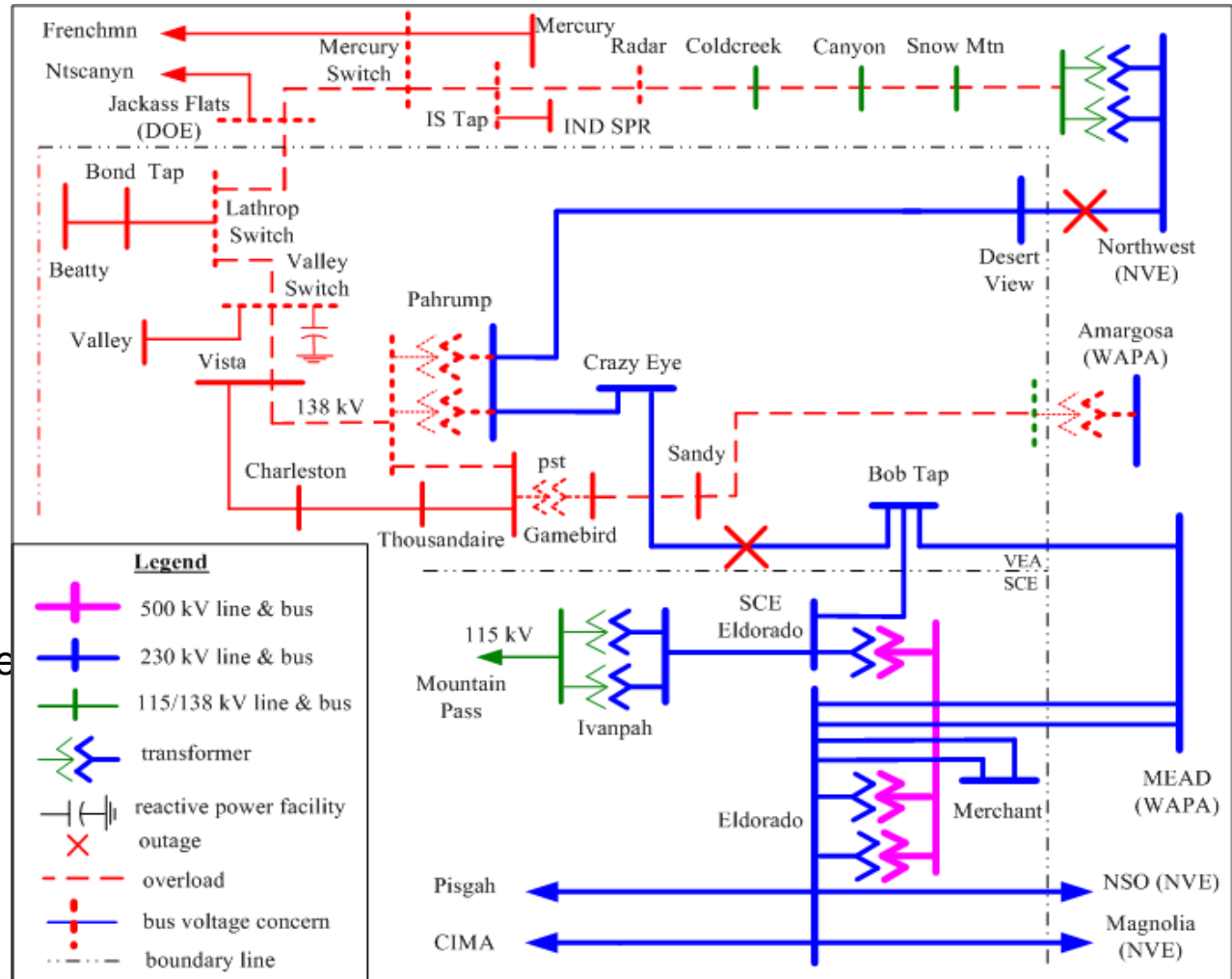
Valley Electric Area – N-1-1 issue (6)

Overload

Load flow diverged (2020)

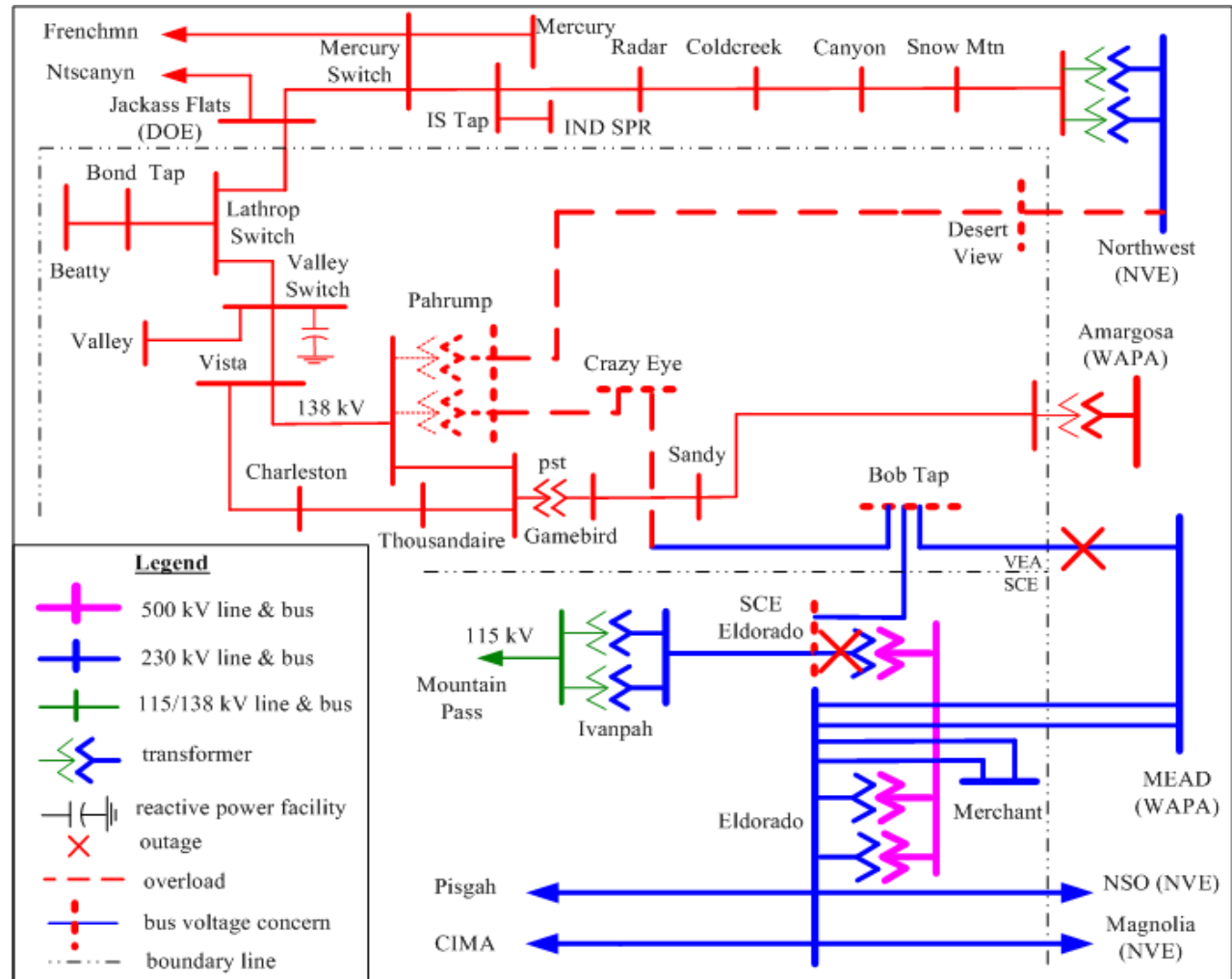
Potential Mitigation

- 1) Modify previously proposed Crazy Eye SPS, or
- 2) Apply congestion management to curtail generation at Crazy Eye sub after 1st outage



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

- Voltage concern
low voltage & voltage deviation (2017, 2022 w/o renewables)
- Load flow diverged
VEA transmission system (2022 with renewables)
- Potential Mitigation
 - 1) Modify Ivanpah SPS and Crazy Eye SPS, or
 - 2) Curtail generation at Ivanpah and/or Crazy Eye sub after 1st outage



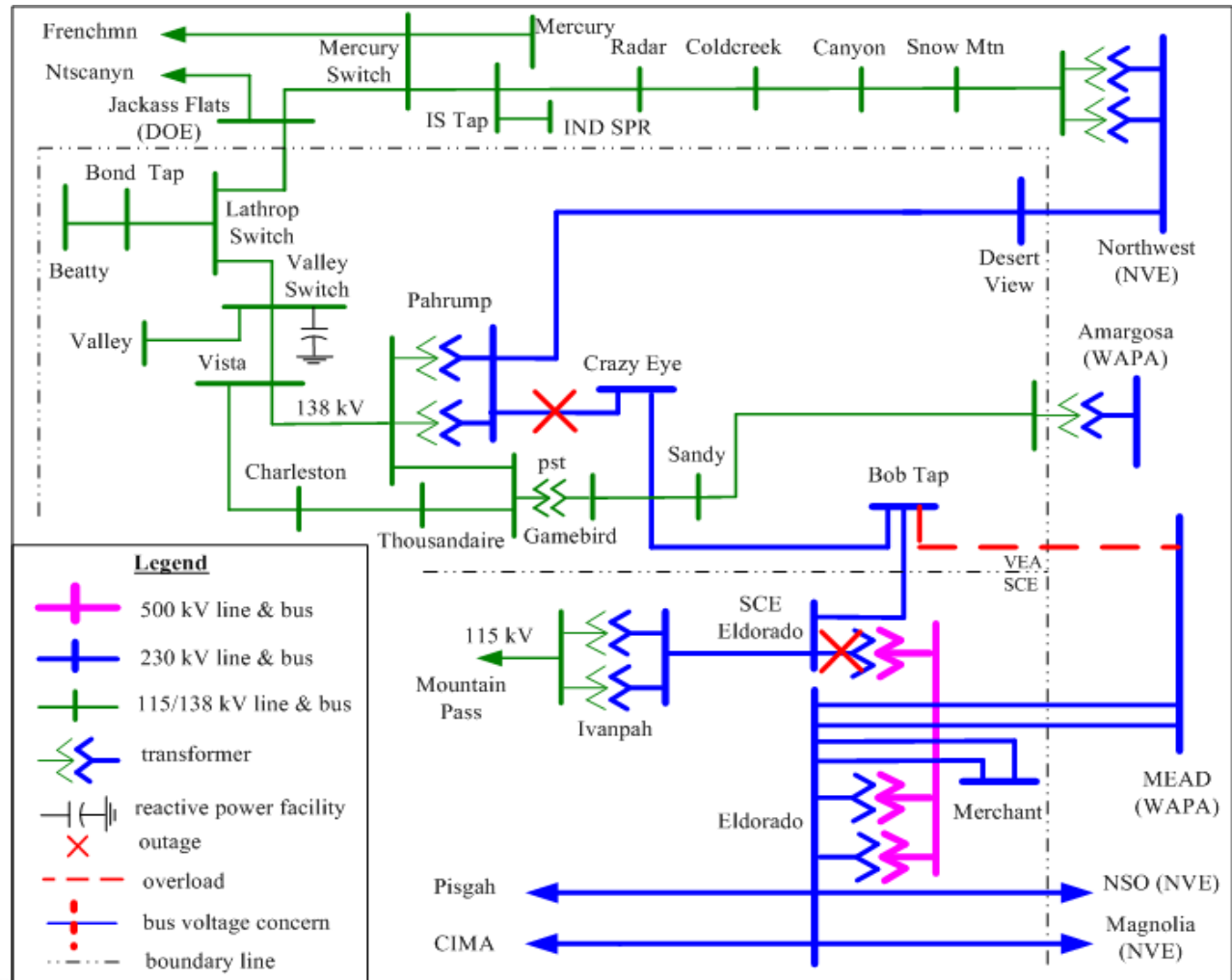
Valley Electric Area – N-1-1 issue (8)

- Overload

Bob Tap-Mead 230 kV line (2022 with renewables)

- Potential Mitigation

- 1) Modify Ivanpah SPS and Crazy Eye SPS, or
- 2) Curtail generation at Ivanpah and/or Crazy Eye sub after 1st outage



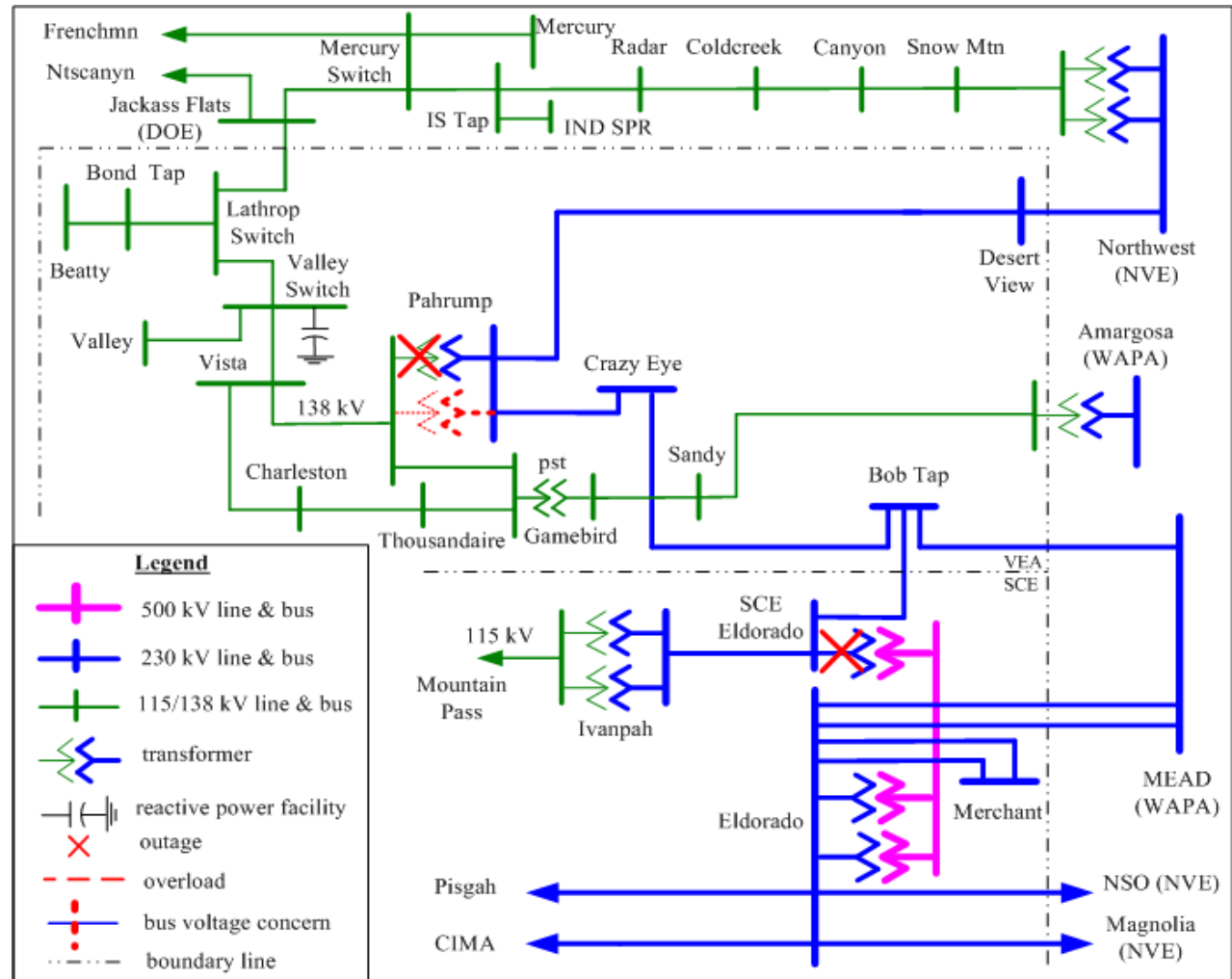
Valley Electric Area – N-1-1 issue (9)

- Overload

As high as 105%
over other
Pahrump 230/138
kV bank
emergency rating
(2017)

- Potential Mitigation

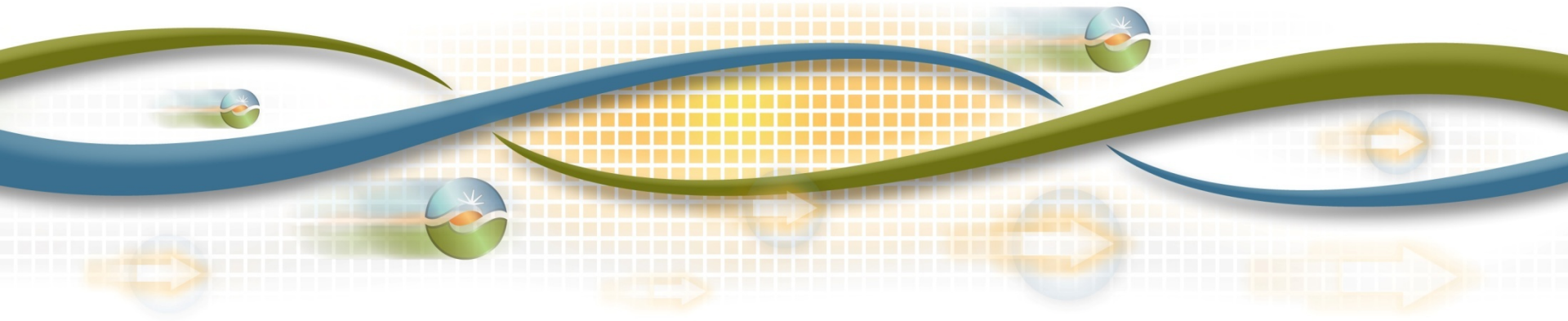
- 1) Develop higher emergency rating for Pahrump 230 /138 kV banks, or
- 2) Modify the Ivanpah SPS



Metro Area Preliminary Reliability Assessment Results

Haifeng Liu
Senior Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



Metro Area



- Includes Orange, Riverside, San Bernardino, Los Angeles, Ventura and Santa Barbara counties
- Over 13,000 MW of existing generation
- Comprised of 115, 230 & 500 kV transmission facilities
- Summer Peak load of 23,447 MW in 2022

Metro Area Assessment Summary

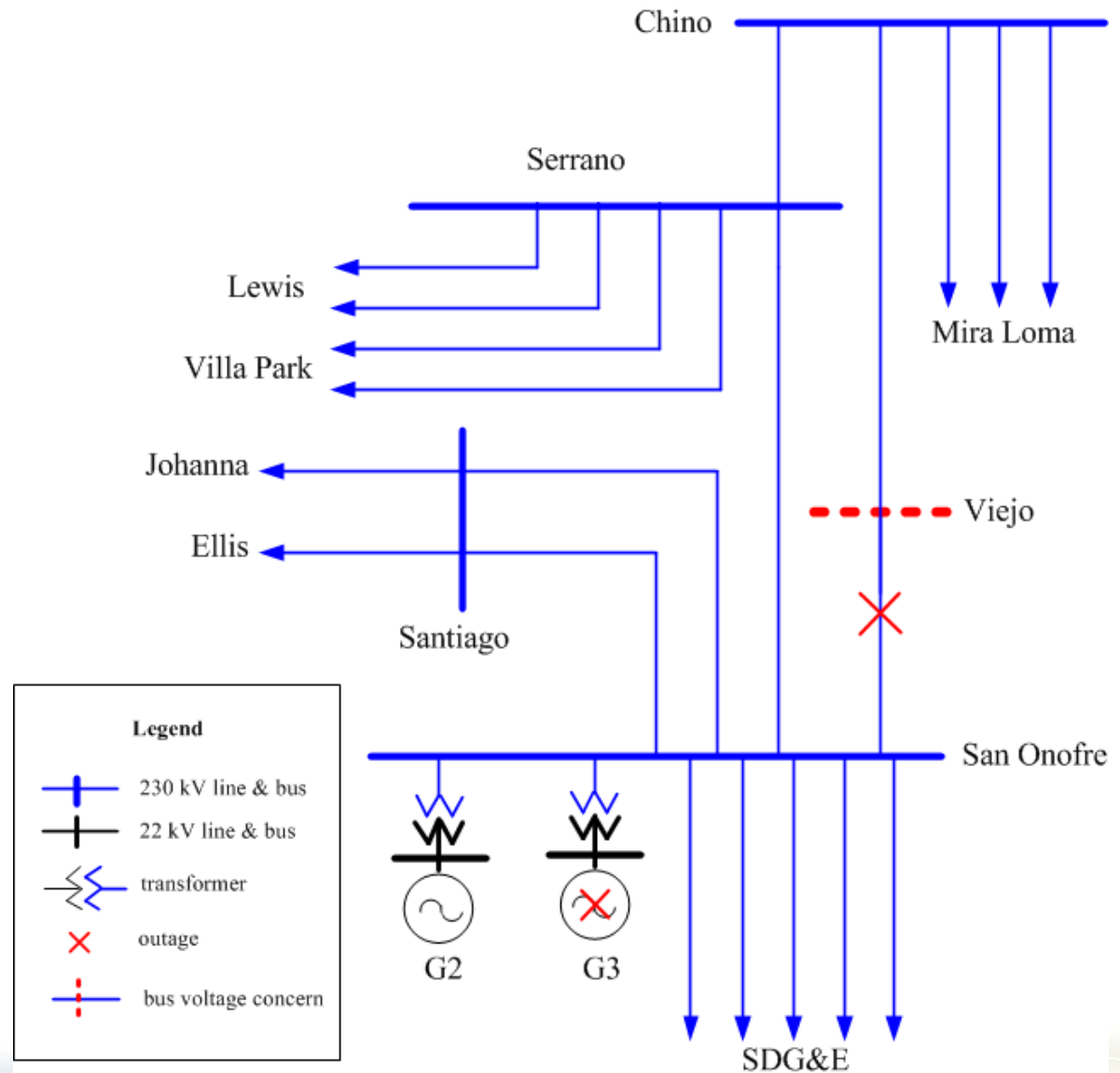
- The assessment identified:
 - Voltage deviation due to Category B - 1
 - Thermal overload due to Category C - 1
- Compared to last year results:
 - One new thermal overload due to Category C

Metro Area Potential Solutions

- Potential Mitigation Solutions
 - Reactive support to mitigate voltage deviation
 - SPS to mitigate overload

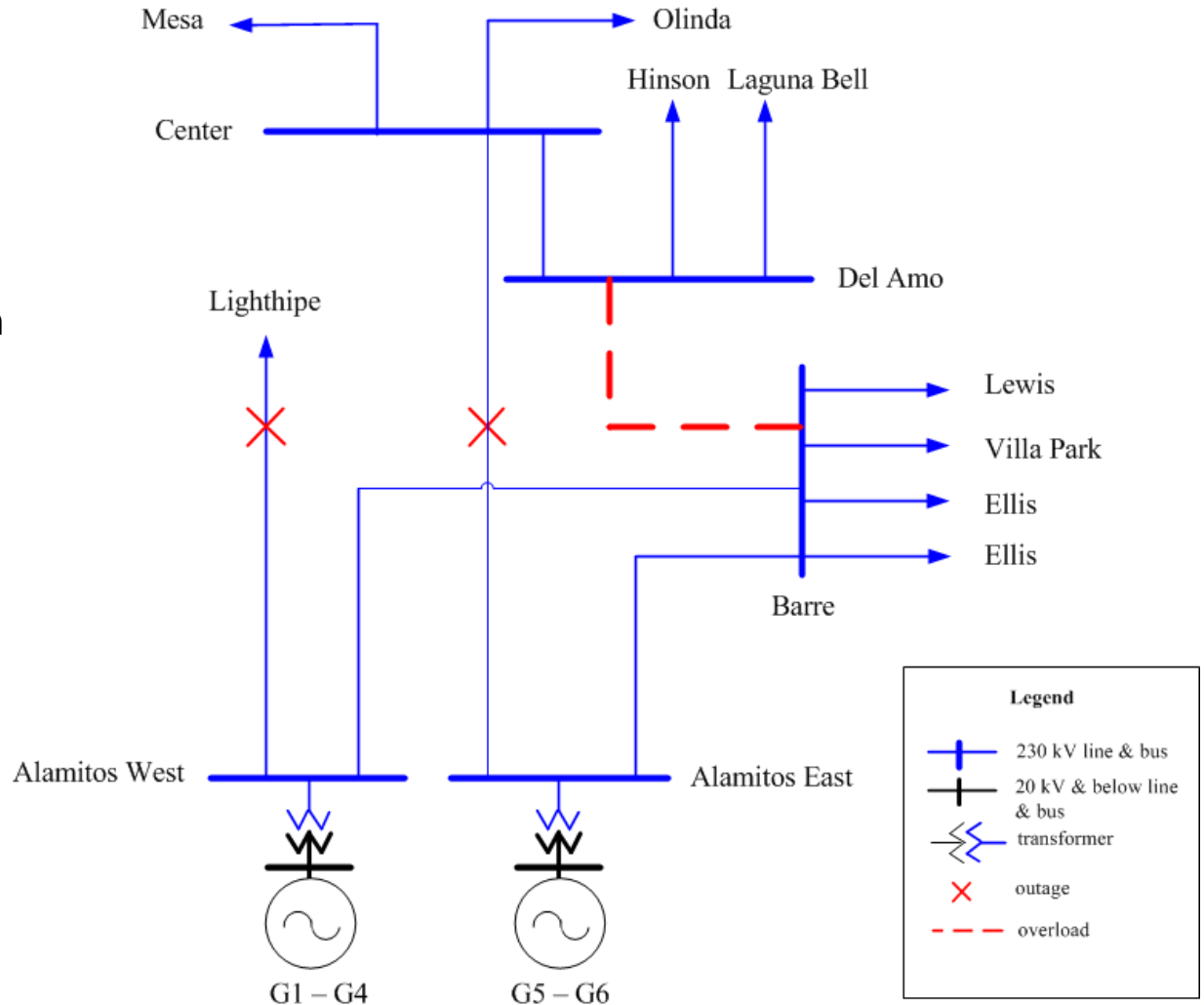
Metro Area – Results

- Voltage Deviation
 - Viejo 230 kV Bus (2022 ~)
- Potential Mitigation
 - Add reactive support at Viejo 230 kV Bus



Metro Area – Results (cont'd)

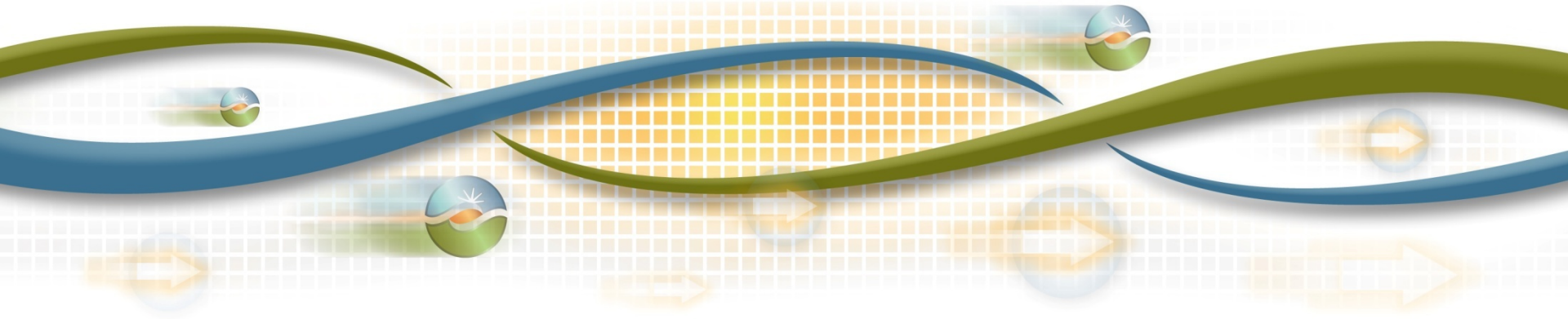
- Thermal Overload
 - Barre – Del Amo 230 kV Line (2022 ~)
- Potential Mitigation
 - SPS to reduce generation and to be evaluated in future planning cycles



Antelope-Bailey and Big Creek Corridor Area Preliminary Reliability Assessment Results

Sanjay Patil
Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



Antelope-Bailey Area



- Comprised of 66 kV transmission facilities.
- Over 431 MW of existing generation.
- Summer Peak load of 838 MW in 2022.

Big Creek Corridor Area



- Comprised of 230 kV transmission facilities.
- Over 5,470 MW of existing generation.
- Over 595 MW of existing pumping load.
- Summer Peak load of 4,727 MW in 2022.

Antelope-Bailey Area (without new renewables) Assessment Summary

- The assessment identified:
 - Thermal overload due to Category C – 1.
 - Low voltage due to Category C – 1.
 - Voltage deviation due to Category C – 1.
- Compared to last year results:
 - Fewer violations as EKWRA was modeled in the base cases.

Antelope-Bailey Area (with new renewables) Assessment Summary

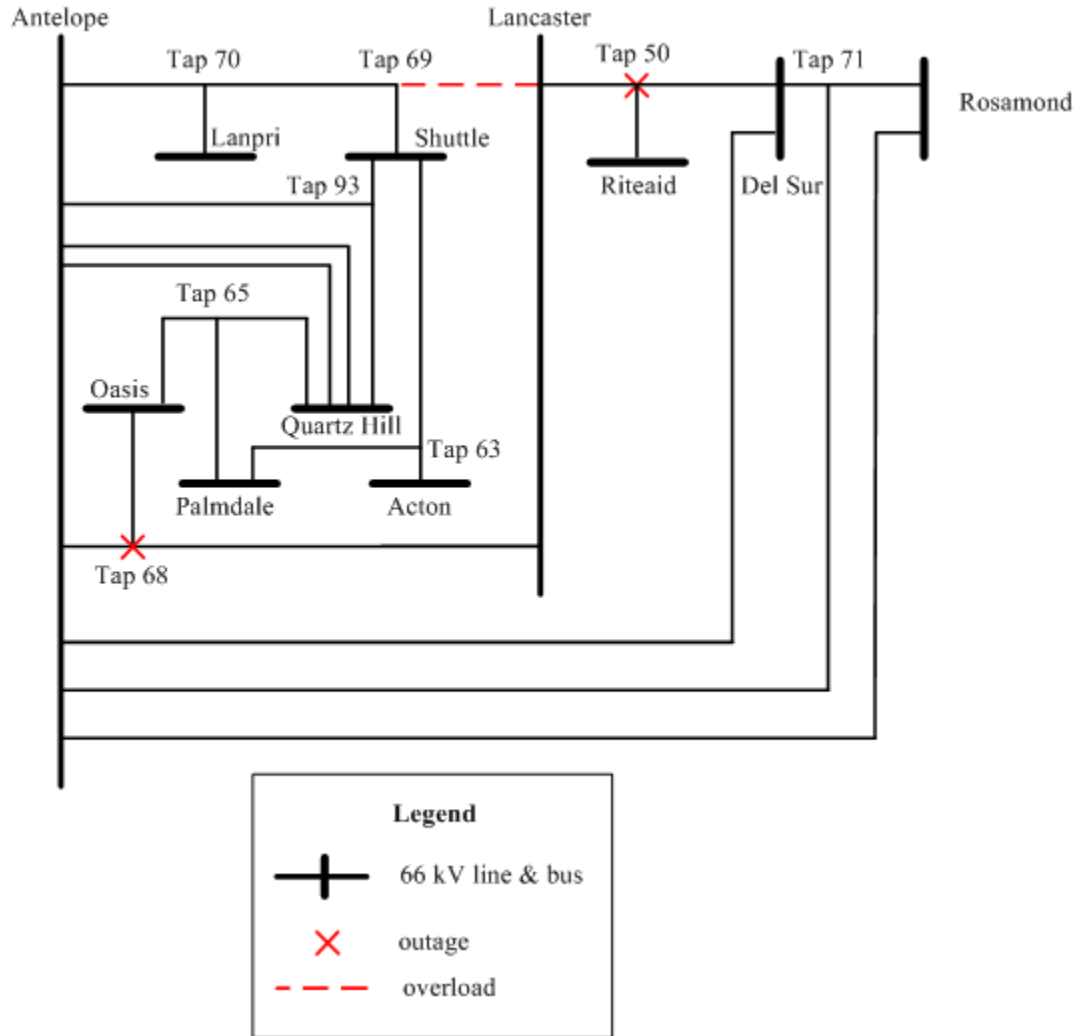
- The assessment identified:
 - Thermal overload due to Category C – 1.
 - Low voltages due to Category B – 5 and Category C – 1.
 - Voltage deviations due to Category B – 19, Category B – 22, and Category C – 1.
- Compared to last year results:
 - Fewer violations as EKWRA was modeled in the base cases.

Antelope-Bailey Area Potential Solutions

- Potential Mitigation Solutions
 - SPS to shed load for Category C thermal overload.
 - Manually switch in shunt caps in Antelope-Bailey area after the first contingency for Category C low voltage and voltage deviation.
 - Review shunt caps switching solution in Windhub area for Category B low voltages and voltage deviations.

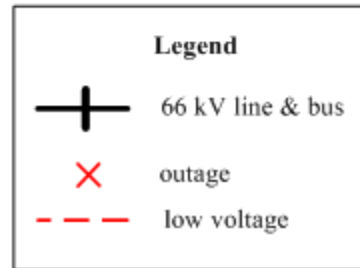
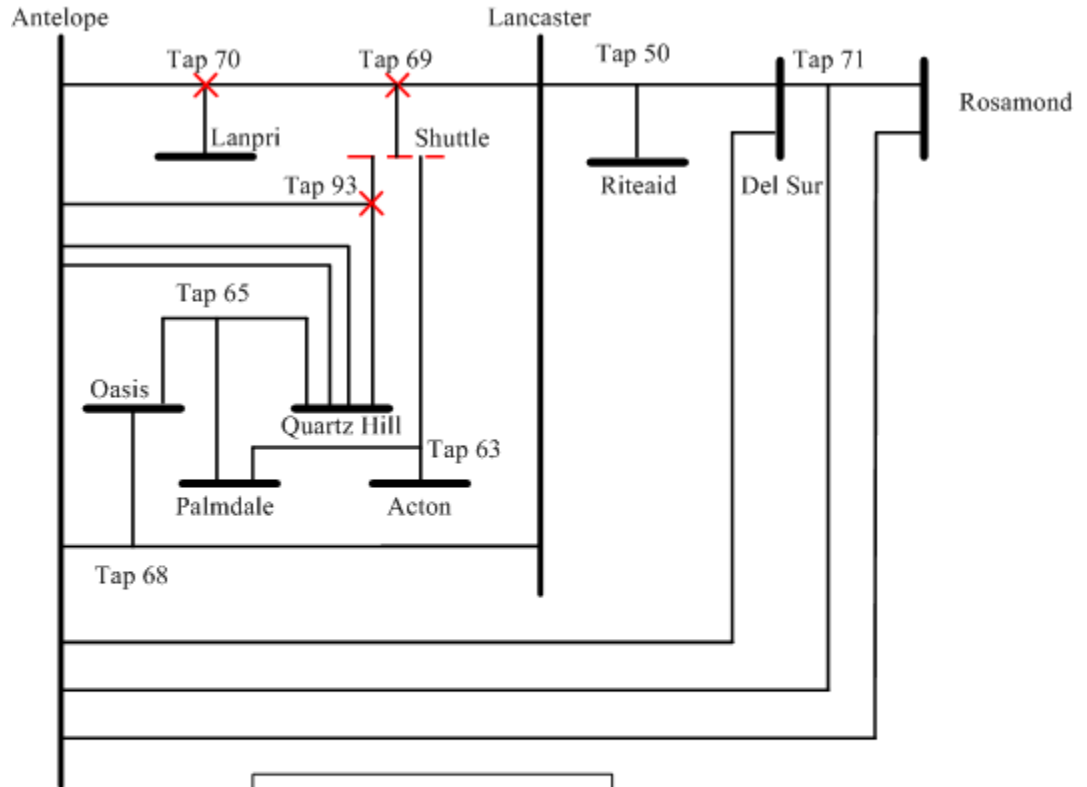
Antelope-Bailey Area – Results

- Thermal Overload
 - Lancaster leg of Antelope-Lanpri-Shuttle-Lancaster 66 kV Line (2014 ~).
- Potential Mitigation
 - SPS to shed load at Lancaster 66 kV.



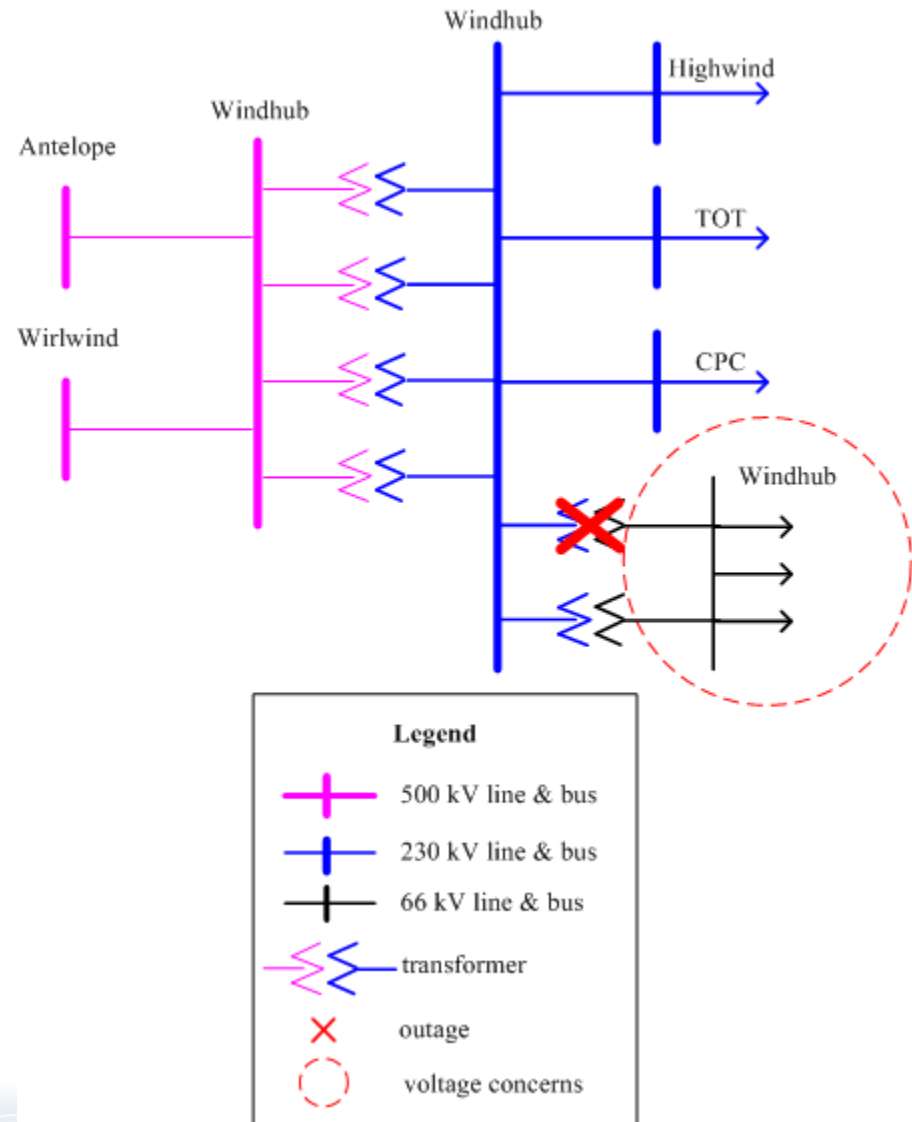
Antelope-Bailey Area – Results

- Low Voltage
 - Shuttle 66 kV (2017 ~).
- Voltage Deviation
 - Shuttle 66 kV (2014 ~).
- Potential Mitigation
 - Manually switch in shunt caps in Antelope-Bailey area after the first contingency.



Antelope-Bailey Area – Results

- Low Voltages
 - Windhub 66 kV area (2014).
- Voltage Deviations
 - Windhub 66 kV area (2014 ~).
- Potential Mitigation
 - Review shunt caps switching solution in Windhub area.



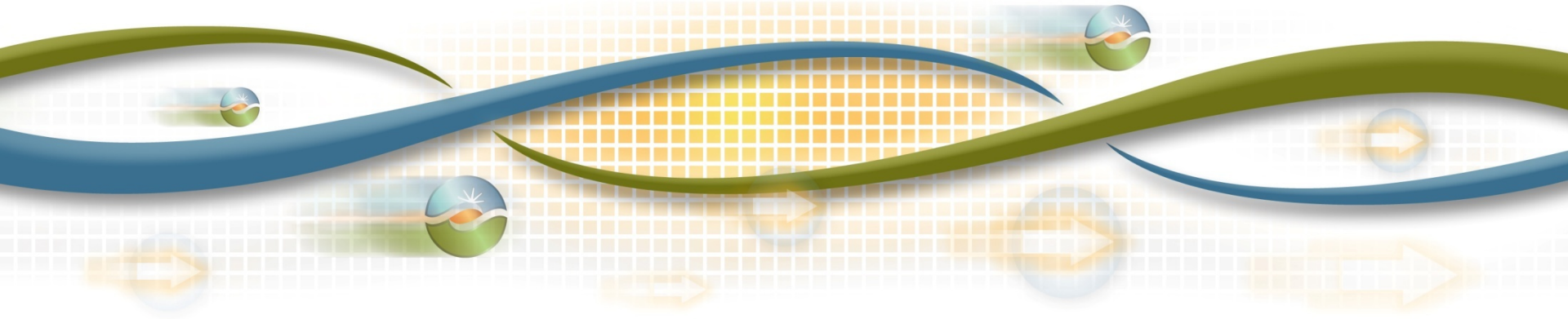
Big Creek Corridor Assessment Summary

- No concerns were identified in the area.

North of Lugo Area Preliminary Reliability Assessment Results

Sanjay Patil
Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



North of Lugo Area



- Comprised of 55, 115, and 230 kV transmission facilities.
- Over 2,615 MW of existing generation.
- Summer Peak load of 1,508 MW in 2022.

North of Lugo Area (without new renewables) Assessment Summary

- The assessment identified:
 - Voltage instability due to Category C – 1.
 - Voltage deviation due to Category B – 1.
- Compared to last year results:
 - Fewer violations due to High Desert Power Project RAS update and Tortilla substation capacitor project.

North of Lugo Area (with new renewables) Assessment Summary

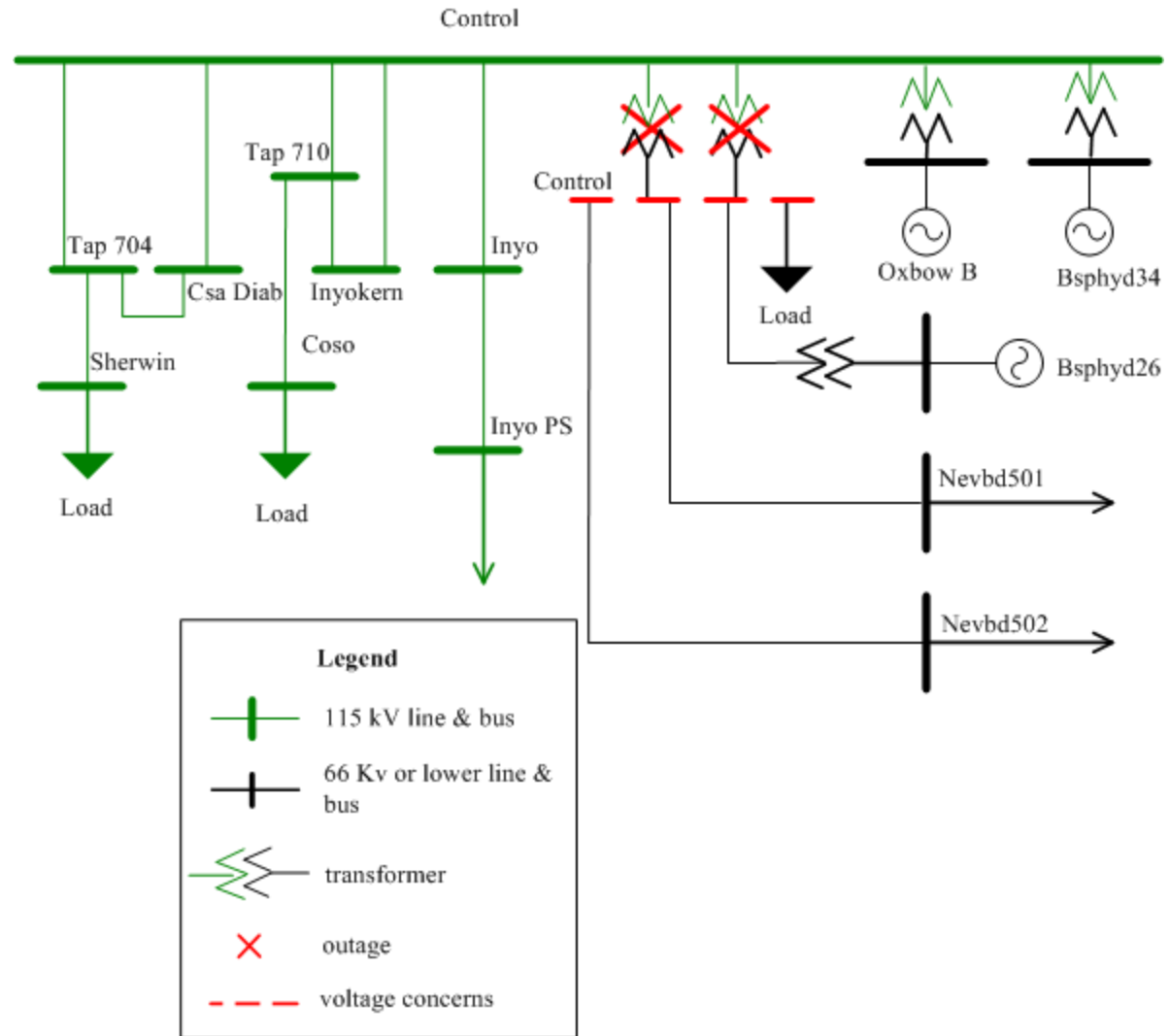
- The assessment identified:
 - Voltage instability due to Category C – 1.
 - High voltages due to Category C – 4.
- Compared to last year results:
 - Fewer violations due to High Desert Power Project RAS update and Tortilla substation capacitor project.

North of Lugo Area Potential Solutions

- Potential Mitigation Solutions
 - SPS to shed load for Category C voltage instability.
 - Install shunt capacitor for Category B voltage deviation.
 - Install shunt reactor for Category C high voltages.

North of Lugo Area – Results

- Voltage Instability
 - Control 55 kV (2017 ~).
- Potential Mitigation
 - SPS to shed load at Control 55 kV.



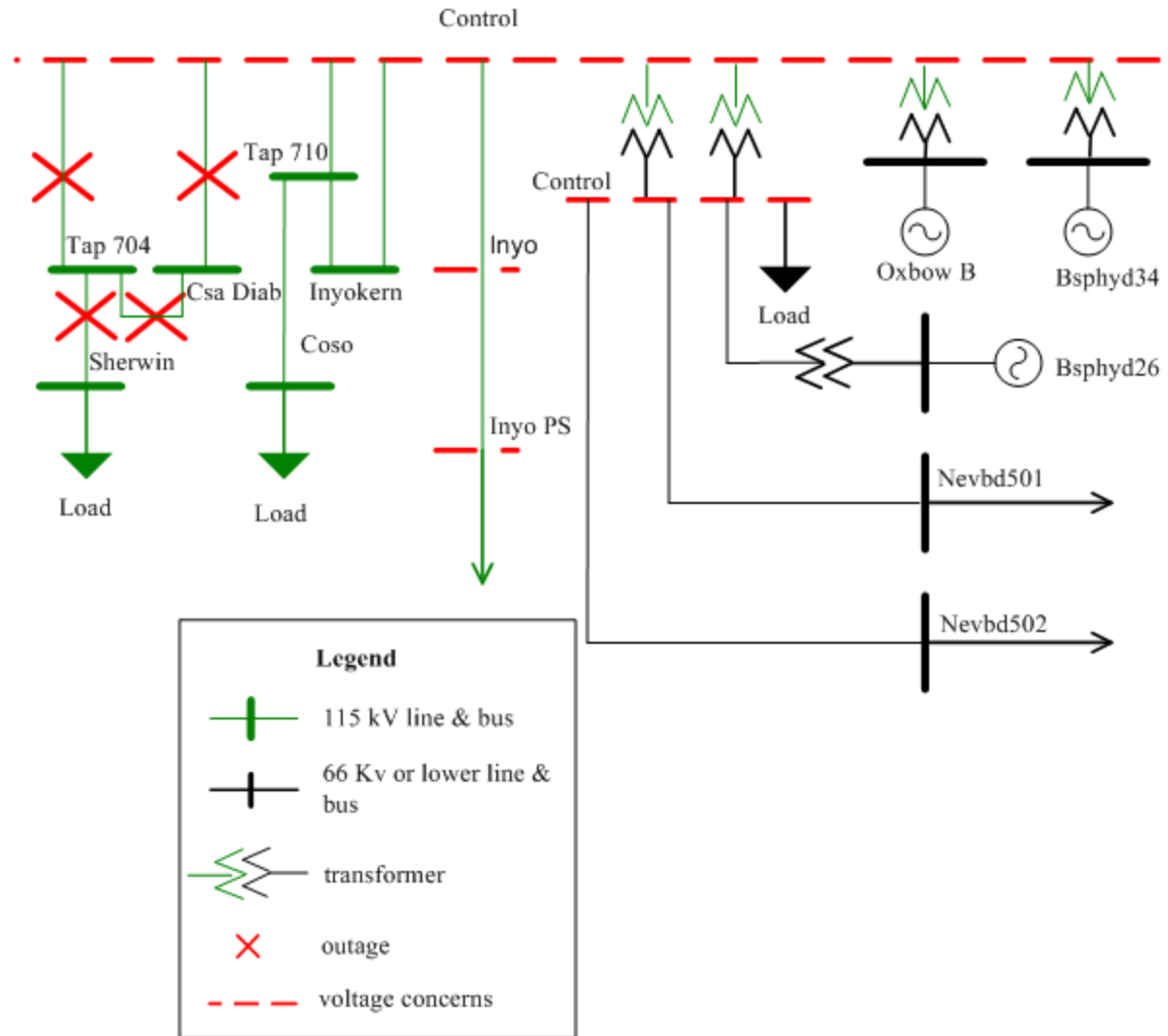
North of Lugo Area – Results

- High Voltages

- Control 55, Control 115, Inyo 115, Inyo PS 115 kV (2014).

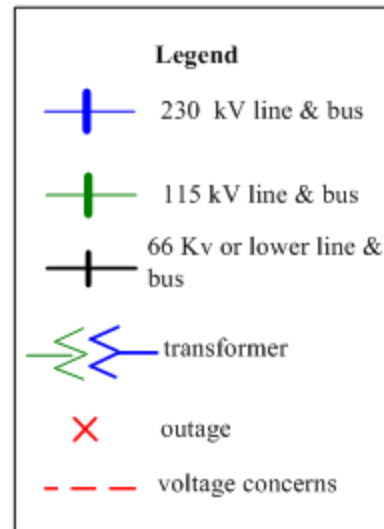
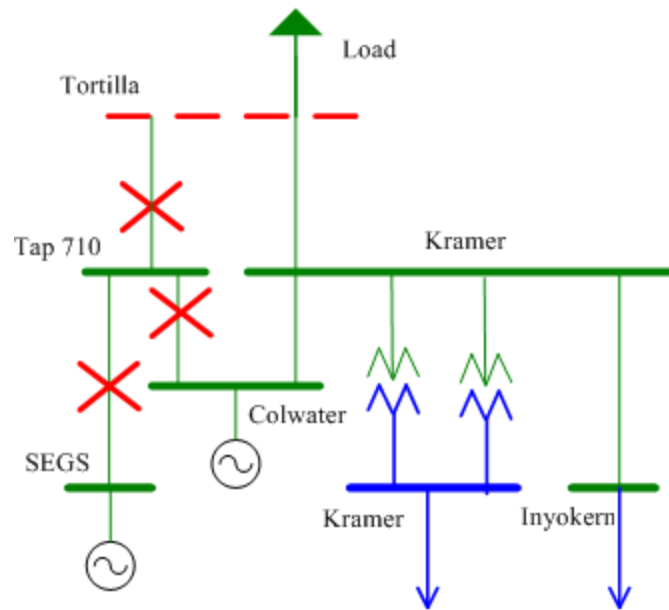
- Potential Mitigation

- Install shunt reactor in Control area.



North of Lugo Area – Results

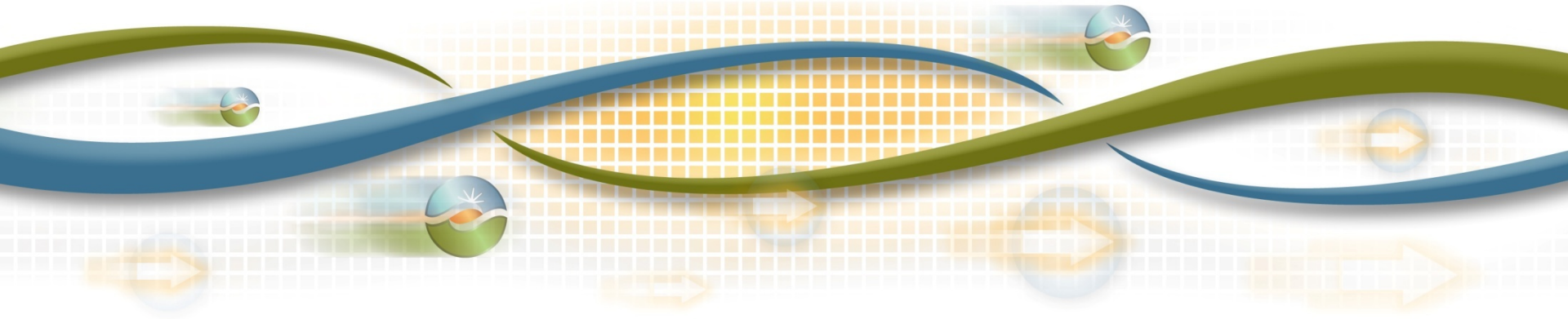
- Voltage Deviation
 - Tortilla 115 kV (2022 ~).
- Potential Mitigation
 - Install shunt capacitor at Tortilla substation.



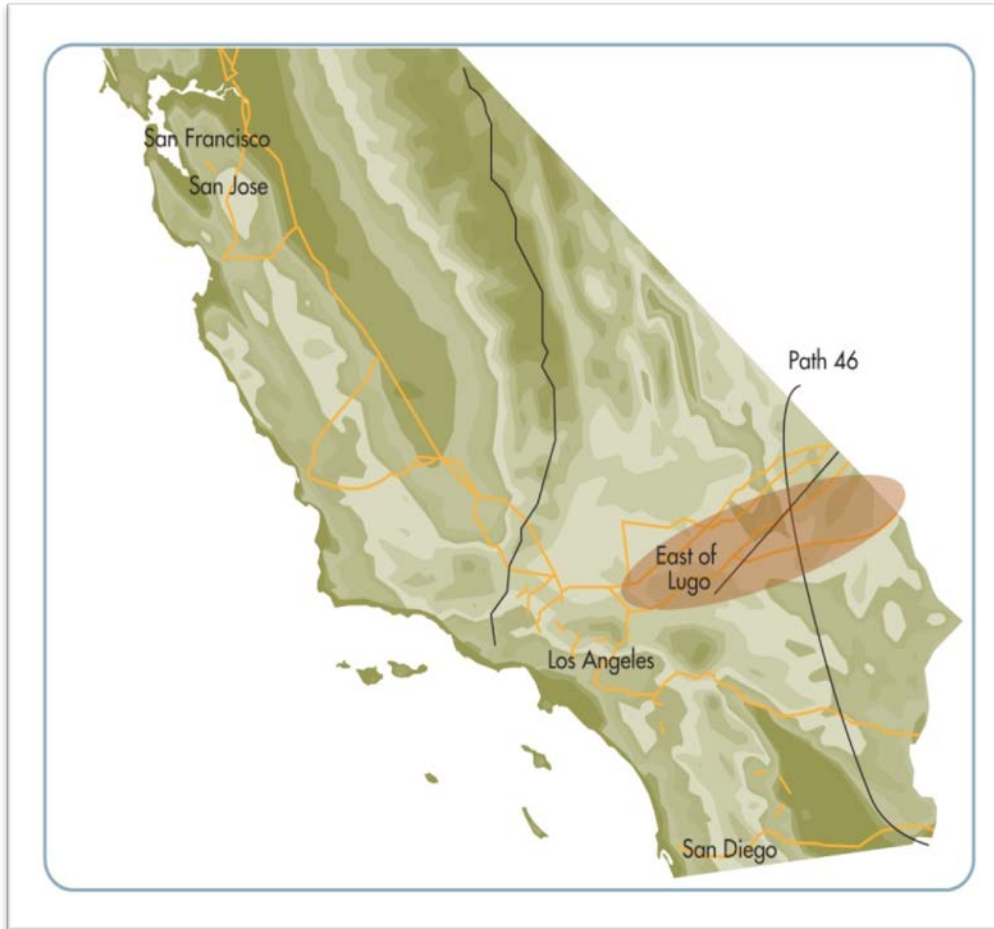
East of Pisgah Area Preliminary Reliability Assessment Results

Frank Chen
Sr. Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



East of Pisgah Area



- Includes Eldorado, Mohave, Merchant, Ivanpah, CIMA, Pisgah Mountain Pass, Dunn Siding and Baker substations
- Generation:
 - 1,022 MW in 2014
- Comprised of 115, 230 & 500 kV transmission facilities.
- Summer Peak load of 33 MW in 2022

East of Pisgah Area Assessment Summary

- The assessment identified:
 - 5 branches overloaded due to Category B & C outages
 - 4 buses with voltage concern for Category B & C outages
 - 2 areas with load flow diverged for Category B & C outages
- Compared to last year results:
 - 1 branch overloaded due to Category C outage
 - 2 areas with load flow diverged for Category B & C outages

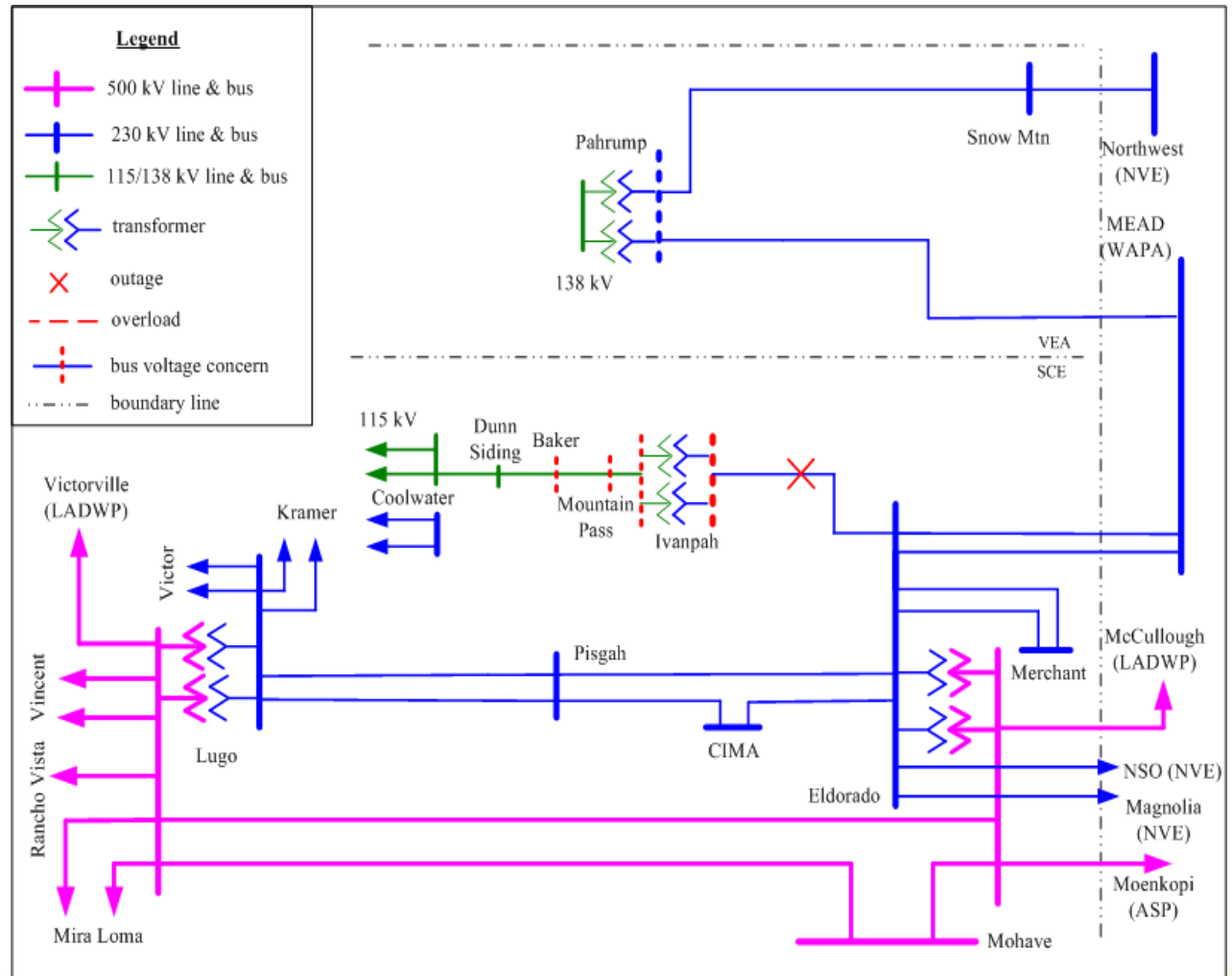
East of Pisgah Area Proposed Solutions

- Potential Mitigation Solutions
 - Add VAR support in Ivanpah 115 kV system (under investigation)
 - Expand Operating Procedures No. 6610 (SOB T-135)
 - Modify previously proposed Ivanpah SPS due to the new tie with VEA
 - Work with VEA to develop higher emergency rating for Pahrump 230 /138 kV Transformers

East of Pisgah Area – N-1 issue (1)

- Load flow diverged
Ivanpah-Baker 115 kV system (2014~)

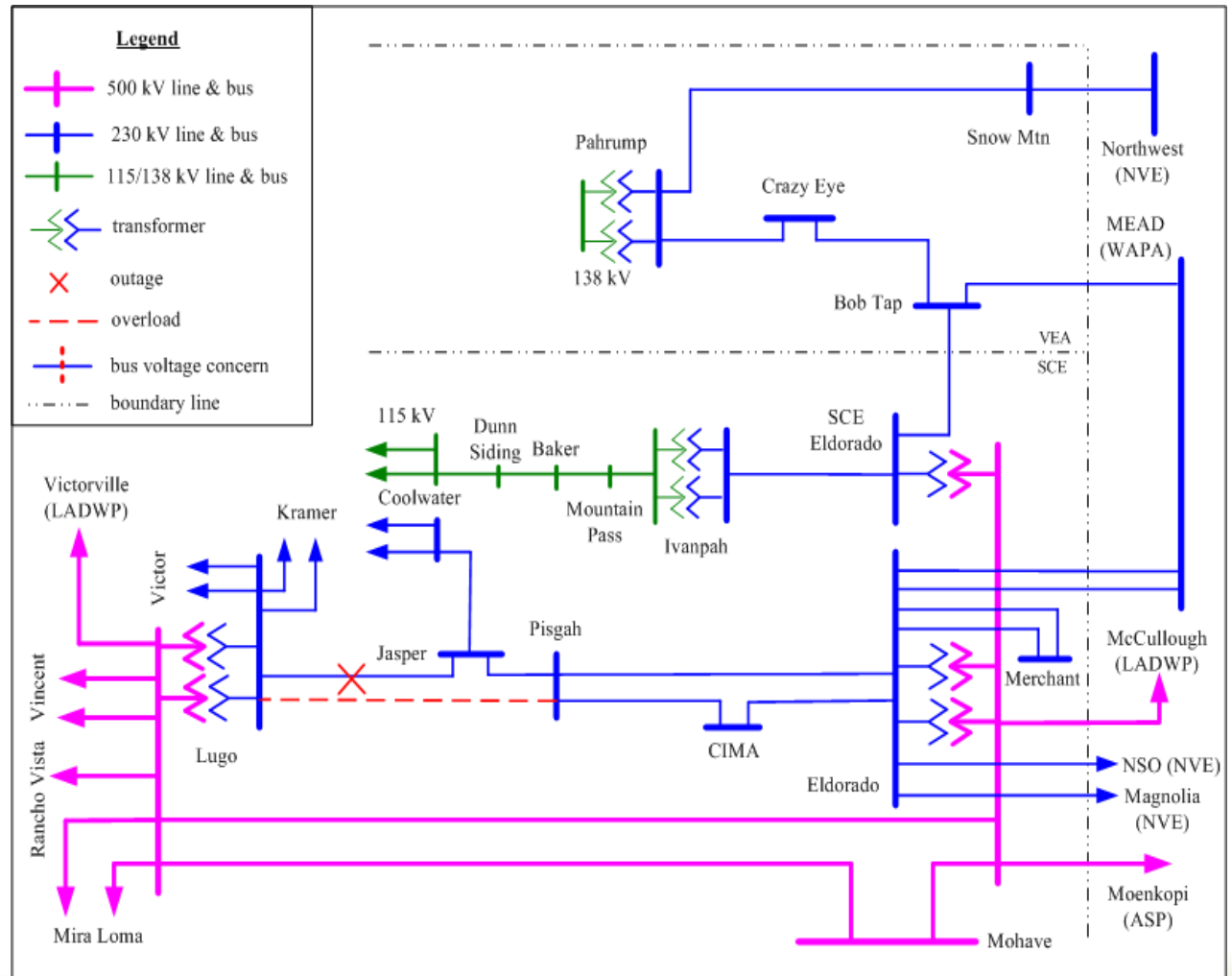
- Potential Mitigation
Add reactive power support in the Ivanpah area (under investigation)



East of Pisgah Area – N-1 issue (2)

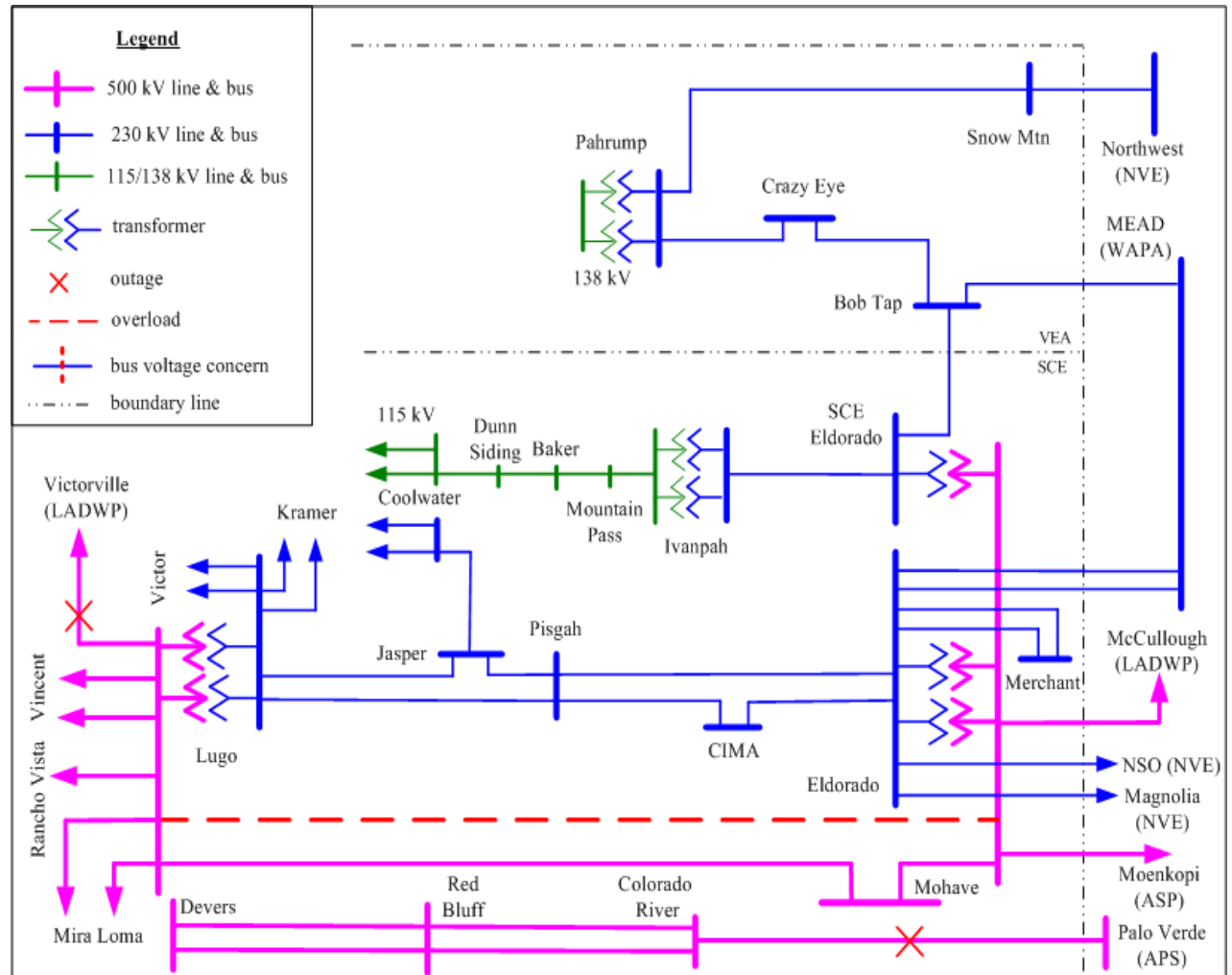
- Thermal overload
Pisgah-Lugo 230 kV line (2022 with renewables)

- Potential Mitigation
Modify previous proposed gen tripping SPS to cover this outage



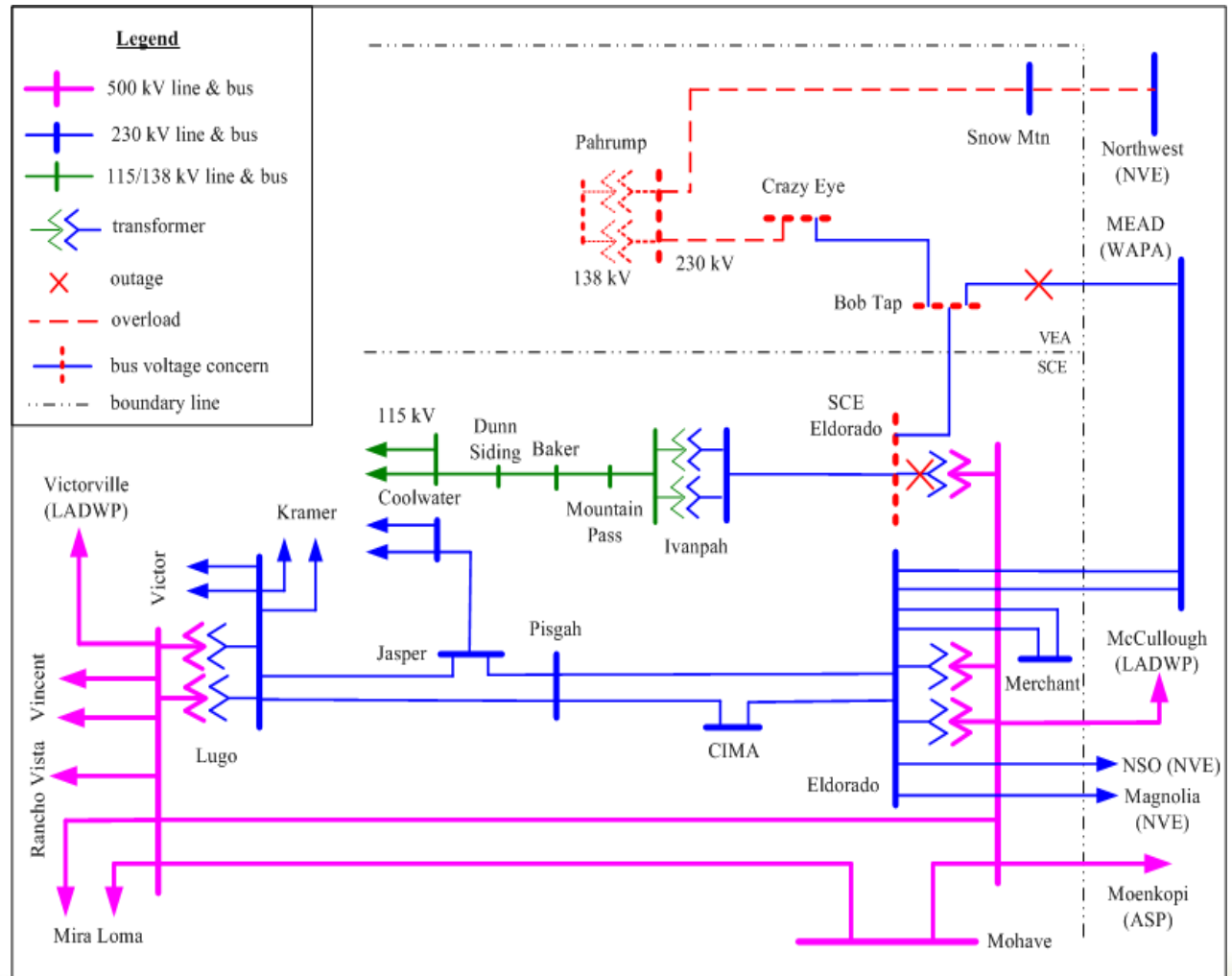
East of Pisgah Area – N-1-1 issue (1)

- Thermal overload
Eldorado-Lugo 500 kV line (2022 with renewables)
- Potential Mitigation
Extend Operating Procedure No. 6610 (SOB T-135)



East of Pisgah Area – N-1-1 issue (2)

- Voltage concern
 - low voltage & voltage deviation (2017, 2022 w/o renewables)
- Load flow diverged
 - VEA transmission system (2022 with renewables)
- Potential Mitigation
 - 1) Modify Ivanpah SPS and Crazy Eye SPS, or
 - 2) Curtail generation at Ivanpah and/or Crazy Eye sub after 1st outage



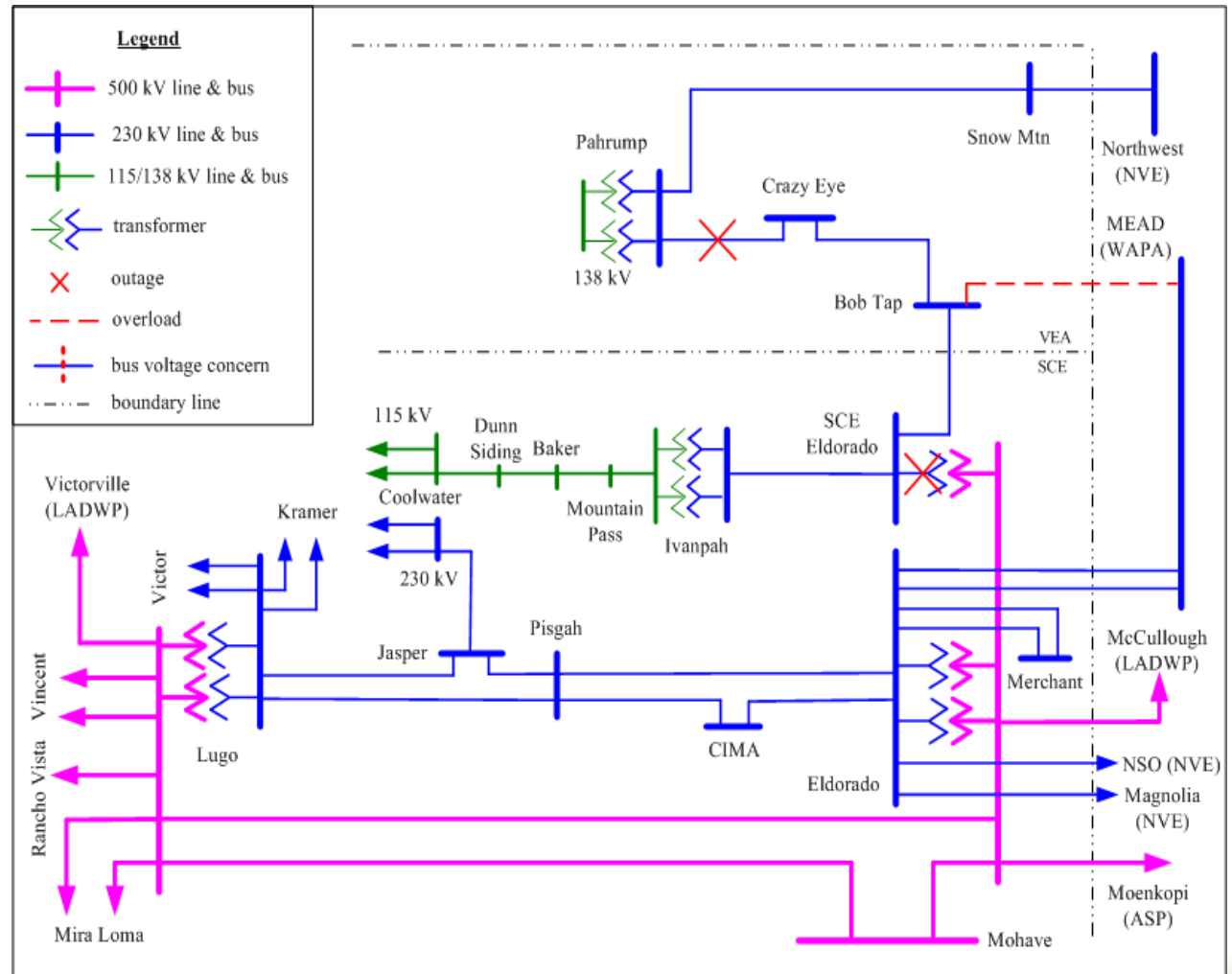
East of Pisgah Area – N-1-1 issue (3)

- Overload

Bob Tap-Mead 230 kV line (2022 with renewables)

- Potential Mitigation

- 1) Modify Ivanpah SPS and Crazy Eye SPS, or
- 2) Curtail generation at Ivanpah and/or Crazy Eye sub after 1st outage



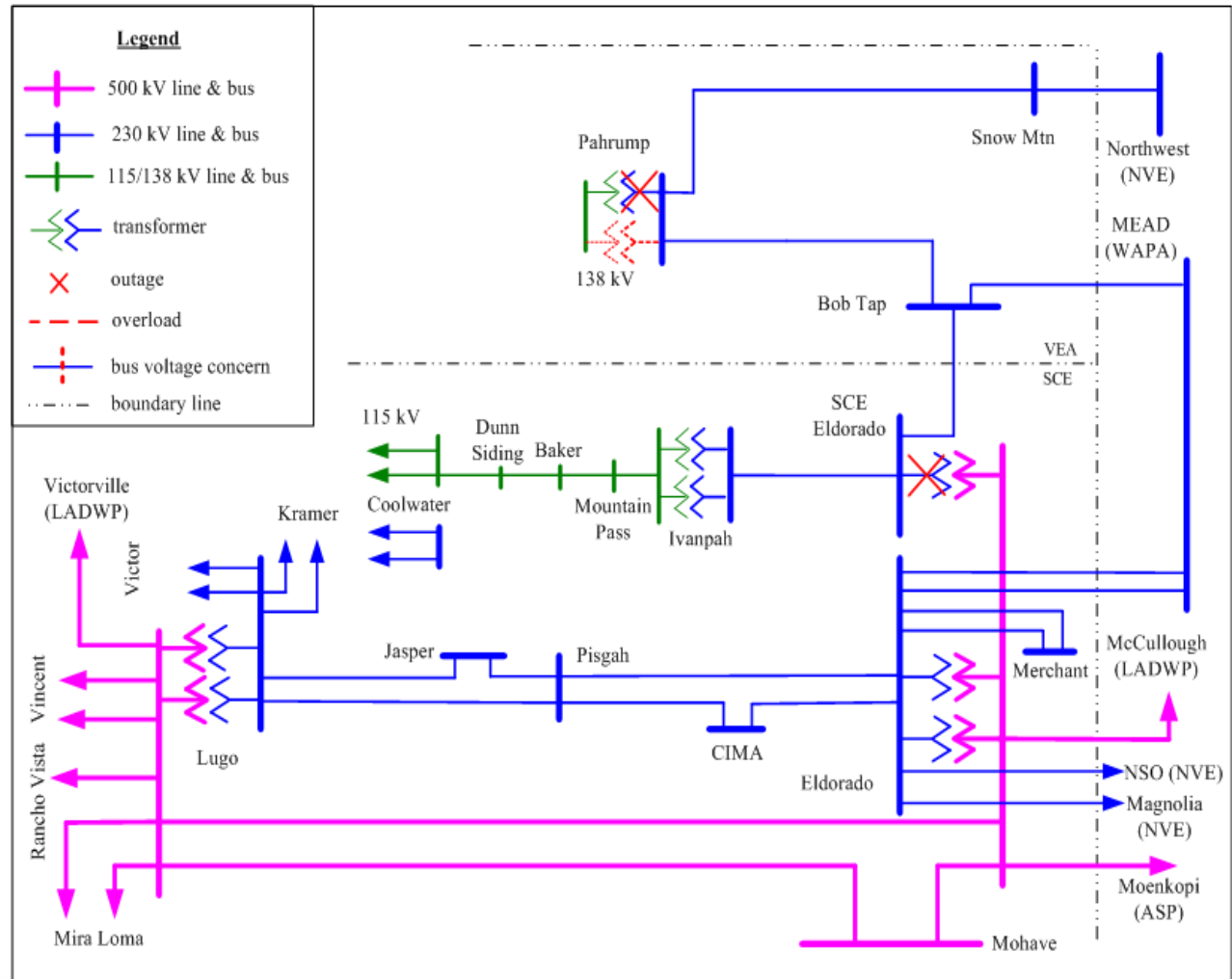
East of Pisgah Area – N-1-1 issue (4)

- Overload

As high as 105%
over other
Pahrump 230/138
kV bank
emergency rating
(2017)

- Potential Mitigation

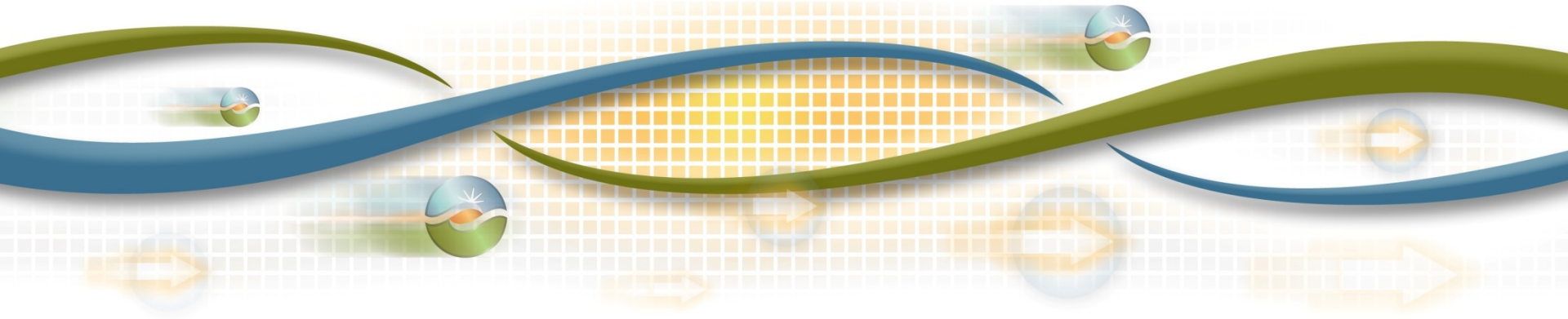
- 1) Develop higher emergency rating for Pahrump 230 /138 kV banks, or
- 2) Modify the Ivanpah SPS



SCE Eastern Area Preliminary Reliability Assessment Results

Nebiyu Yimer
Senior Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



SCE Eastern Area



- Includes the SCE owned transmission system in the Riverside County west of the Devers Substation
- Generation: over 2,000 MW of generation
- Comprised of 500, 230, 161 and 115 kV transmission facilities.
- Summer Peak load of 1110 MW in 2022
- ISO will be handing over control of the Devers/Mirage 115 kV facilities once the system is split (2013)

SCE Eastern Area Assessment

- The assessment identified:
 - 1 Category B and 4 Category C overloads
 - 0 Category B and 2 Category C low voltage problems
 - 1 Category B and 0 Category C voltage deviations
- Compared to last year results:
 - 1 previously approved project eliminated 1 Category B overload
 - New loading and voltage problems
 - Last year there were 0 approved projects in this area

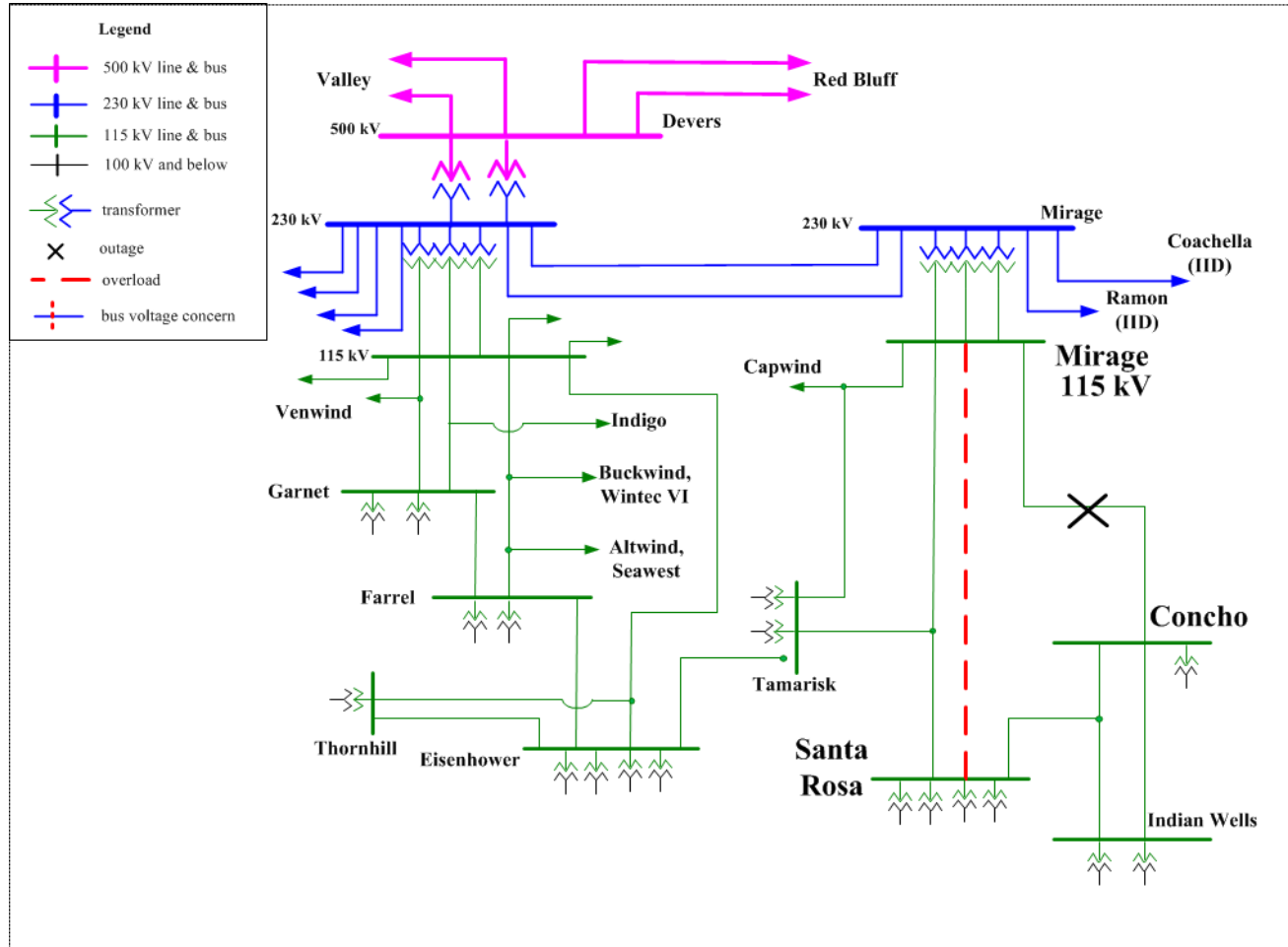
SCE Eastern Area Proposed Solutions

- Potential Mitigation Solutions
 - 1 potential 115 kV upgrade (2022 ~)
 - Operating solutions, SPS modifications

SCE Eastern Area – Results

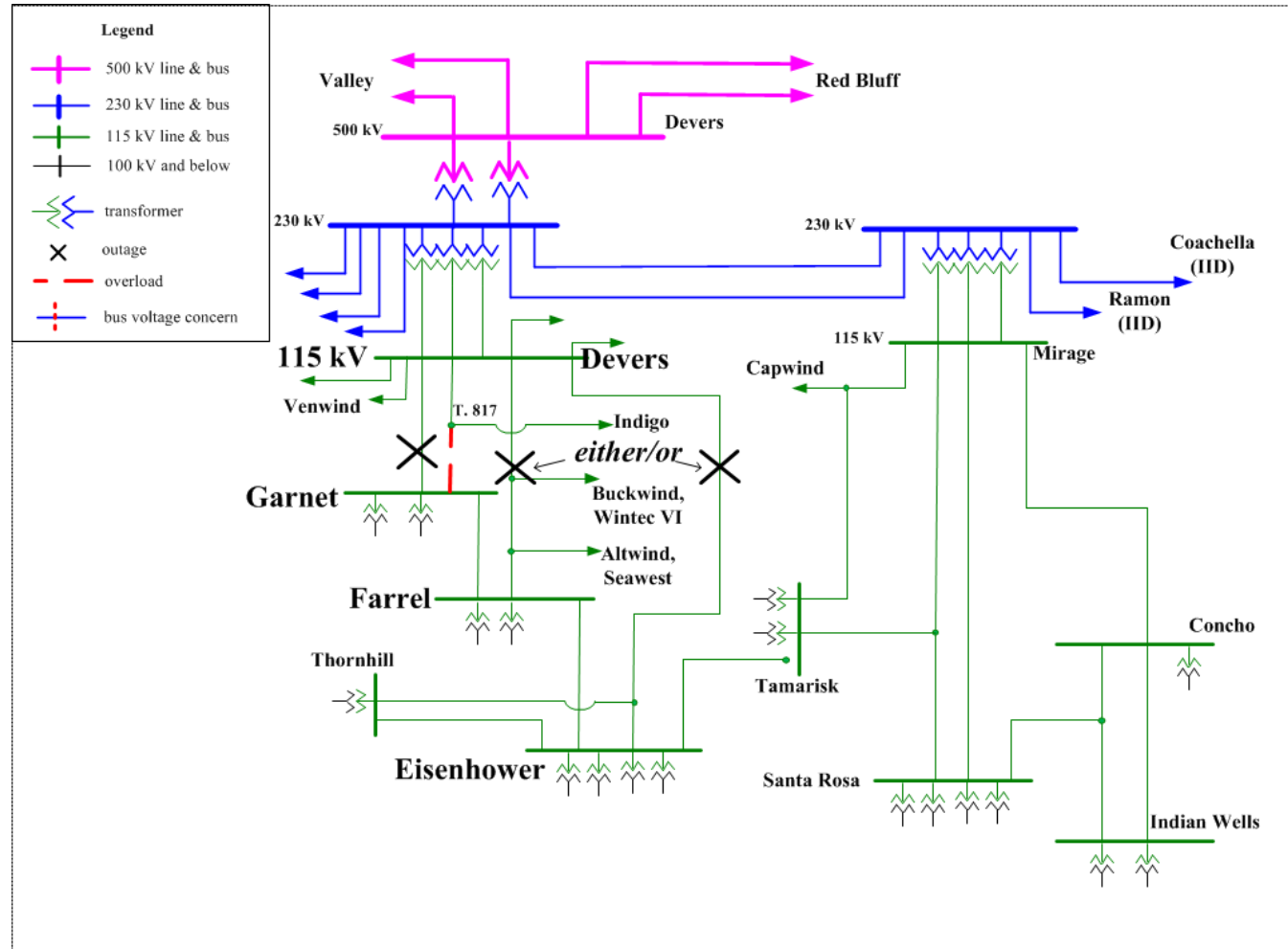
- Thermal Overload
 - Mirage - Santa Rosa 115 kV line (2022 ~)

- Potential Mitigation
 - Build new 115 kV line or upgrade overloaded line



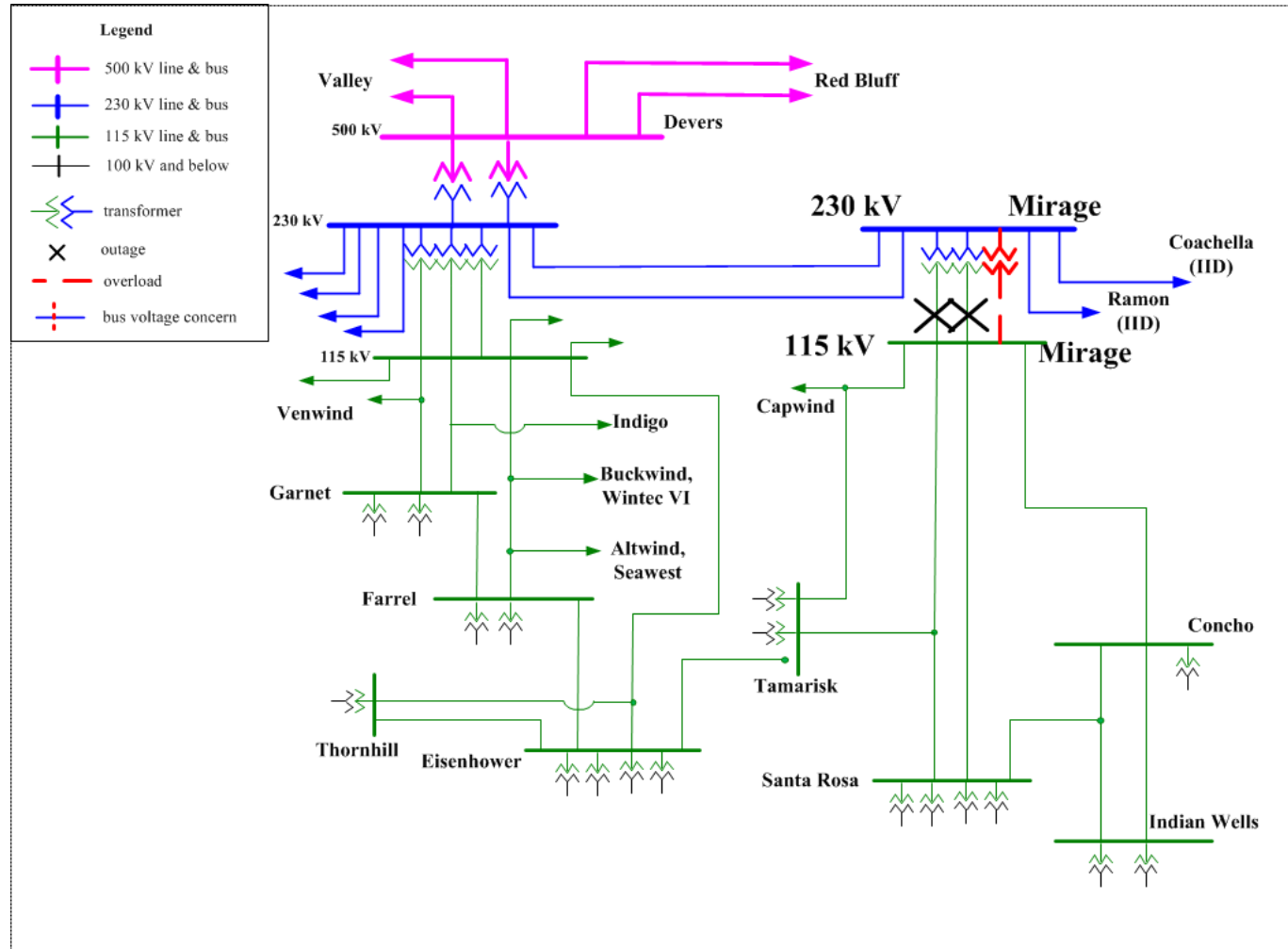
SCE Eastern Area – Results

- Thermal Overloads
 - Garnet-Indigo Tap 115 kV Line (2017 ~)
- Potential Mitigation
 - Operating solution/ SPS modification



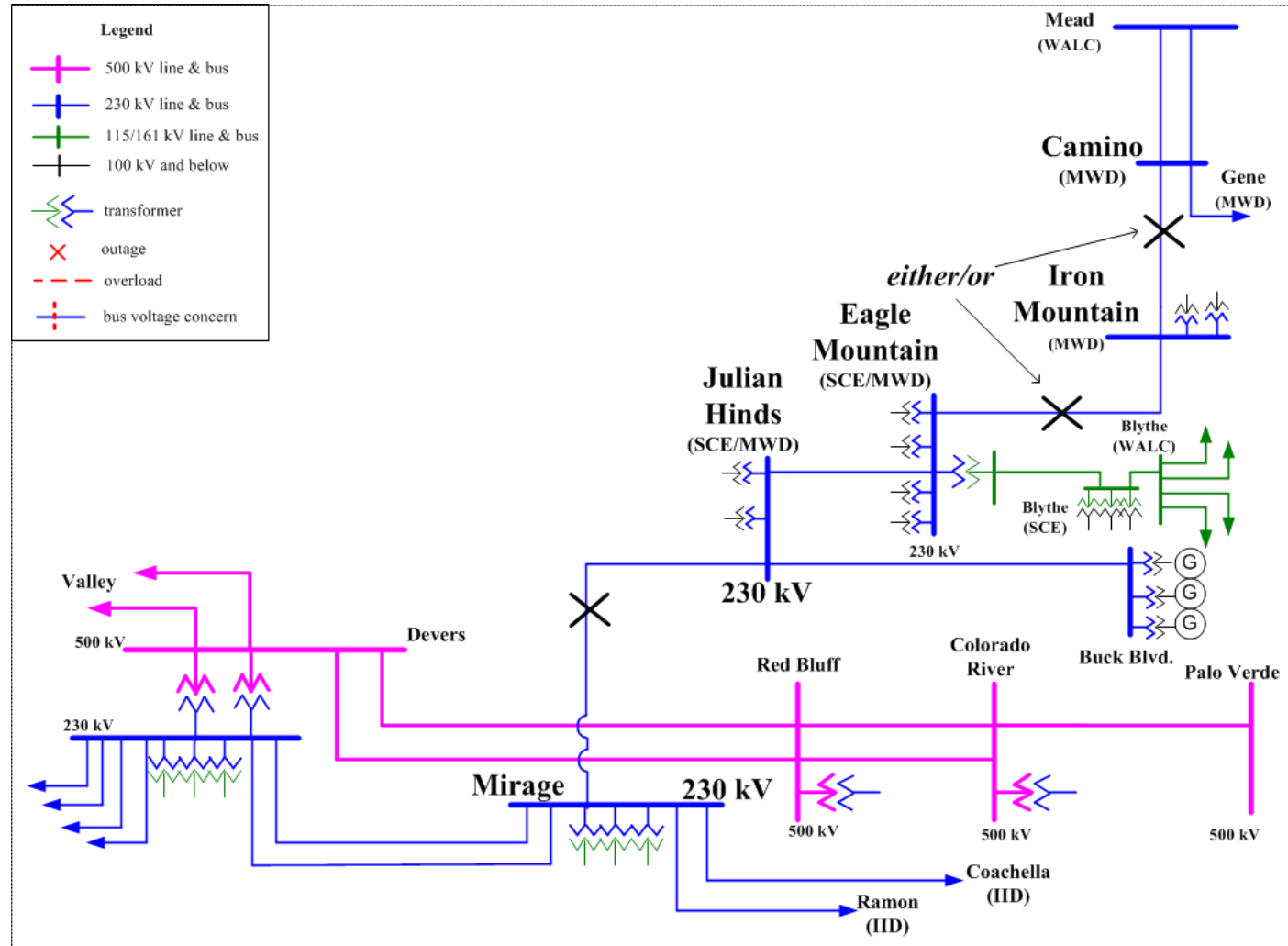
SCE Eastern Area – Results

- Thermal Overloads
 - Mirage 230/115 kV banks (2014 ~)
- Potential Mitigation
 - Operating solution/ SPS modification



SCE Eastern Area – Results

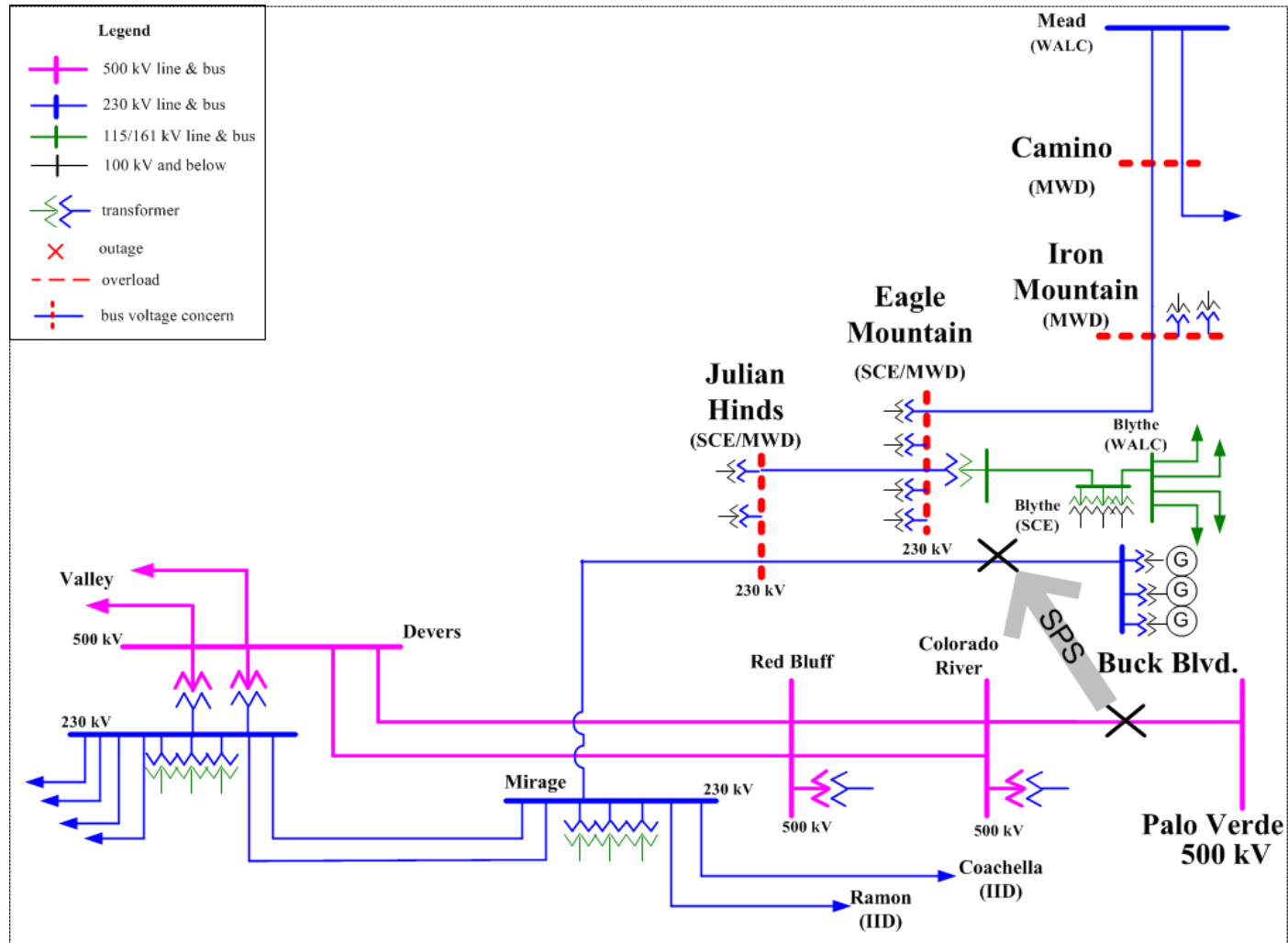
- Divergence (2014 ~)
- Potential Mitigation
 - Operating solution



SCE Eastern Area – Results

- Voltage Deviation
 - Julian Hinds, Eagle Mountain, Iron Mountain, Camino (2014 ~)

- Potential Mitigation
 - Operating solution

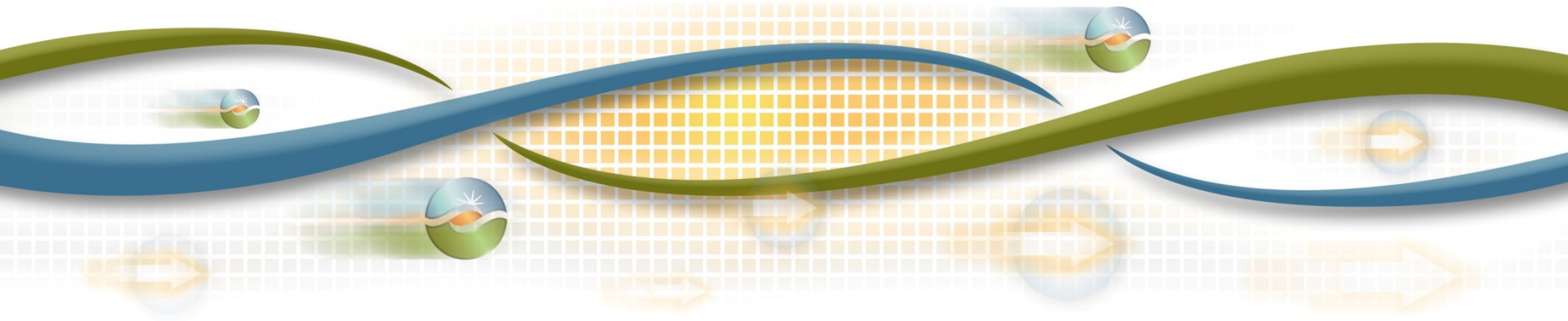




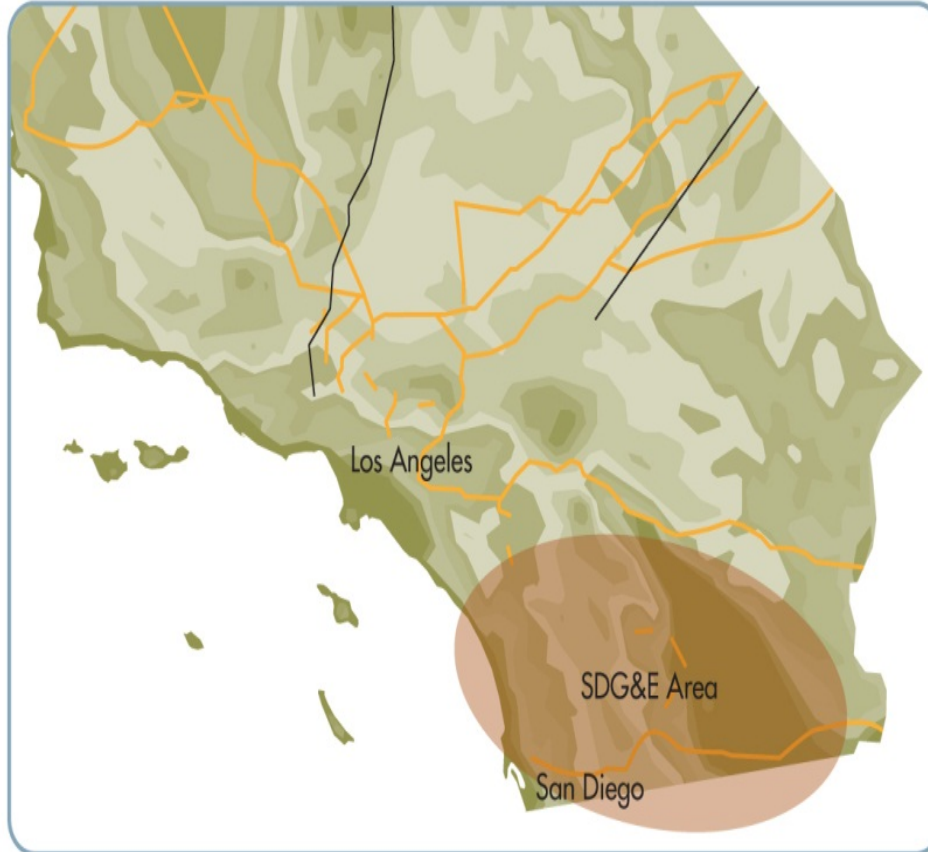
San Diego Gas & Electric Area Preliminary Reliability Assessment Results

Sushant Barave
Senior Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



SDG&E Area



- Service area encompasses about 4,100 sq miles from Southern Orange County to the US-Mexico border.
- Generation: Over 3,000 MW of qualifying capacity
- Comprised of 69, 138, 230 & 500 kV transmission facilities.
- Summer Peak load of 5,845 MW in 2022

SDG&E Area Assessment Summary

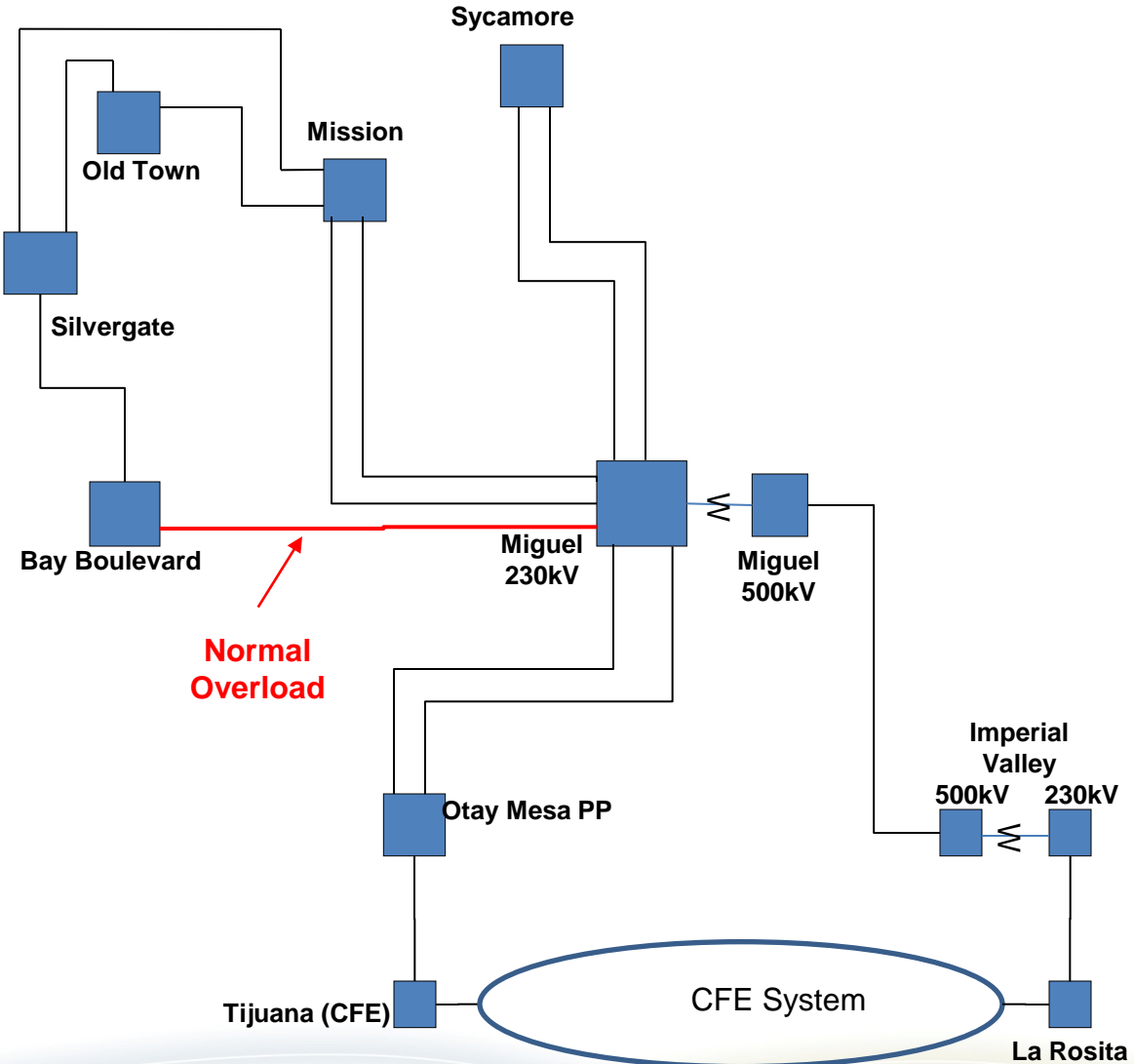
- The assessment identified:
 - Thermal overloads due to Category A – 1, due to Category B – 8 and several due to Category C
 - Low voltages due to category C – 13
 - Several high voltages due to category A
 - Voltage deviations due to Category B – 9, due to Category C – 20
- Compared to last year results:
 - 5 new approved projects eliminated multiple Category B and Category C overloads
 - Very few new low voltage problems

SDG&E Area Potential Solutions

- Potential Mitigation Solutions
 - Generation re-dispatch, Reconductor/Upgrades, SPS (only for Category C overloads and voltage issues)
 - Operational action plan for Category C contingencies – includes generation re-dispatch and/or switching solutions and/or controlled load drop in local area networks after the first contingency

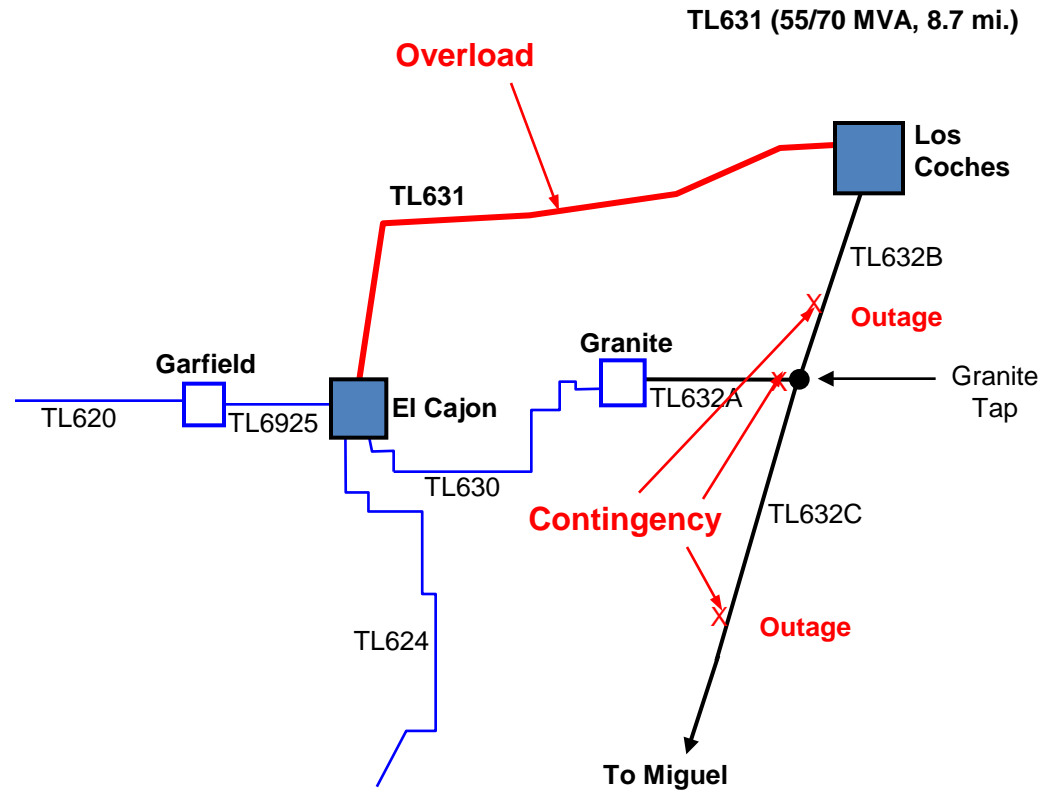
SDG&E Area – Results

- Thermal Overloads
 - Bay Blvd – Miguel 230kV line (2022 ~)
- Potential Mitigation
 - Re-rate the line or Generation re-dispatch or Reconductor. Re-evaluate in future planning cycles.



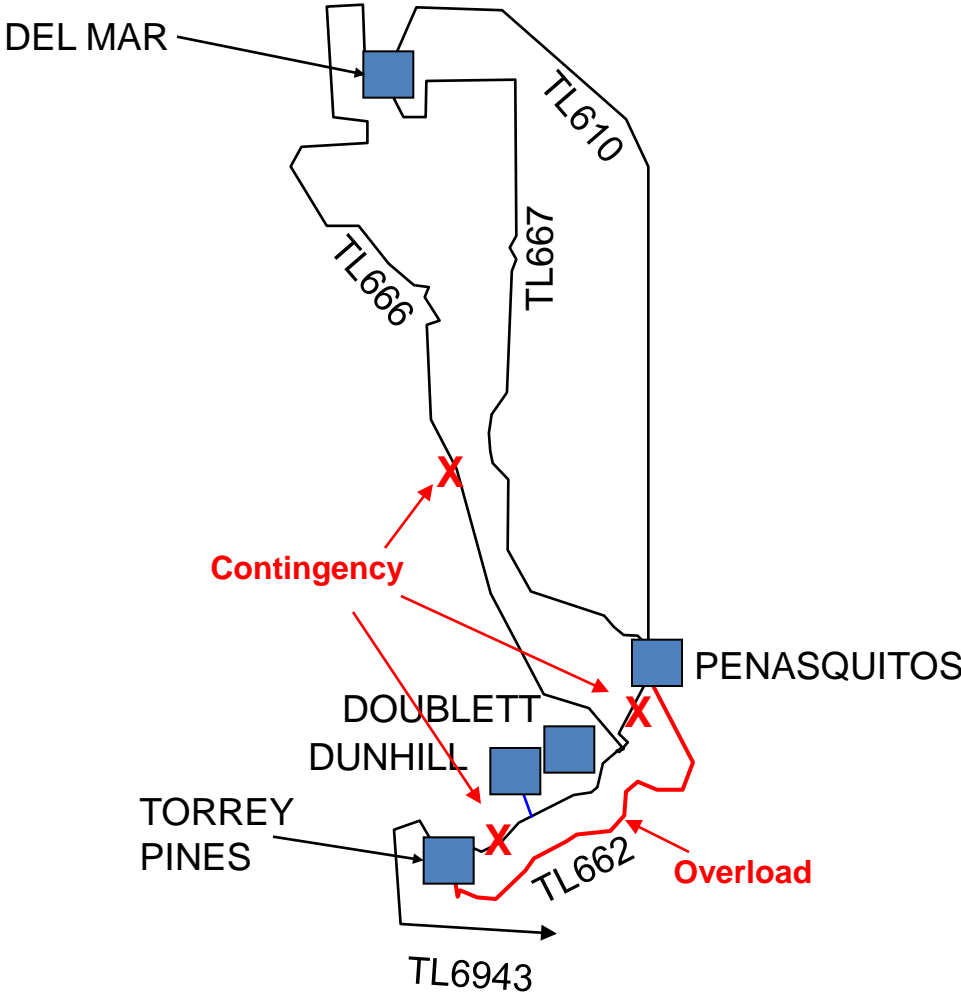
SDG&E Area – Results

- Thermal Overloads
 - TL 631, El Cajon – Los Coches 69kV line (2014 ~)
- Potential Mitigation
 - Generation re-dispatch



SDG&E Area – Results

- Thermal Overloads
 - TL 662, Penasquitos – Torrey Pines 69kV line (2022 ~)
- Potential Mitigation
 - Re-evaluate in future planning cycle. Investigate the potential for re-rating this line.



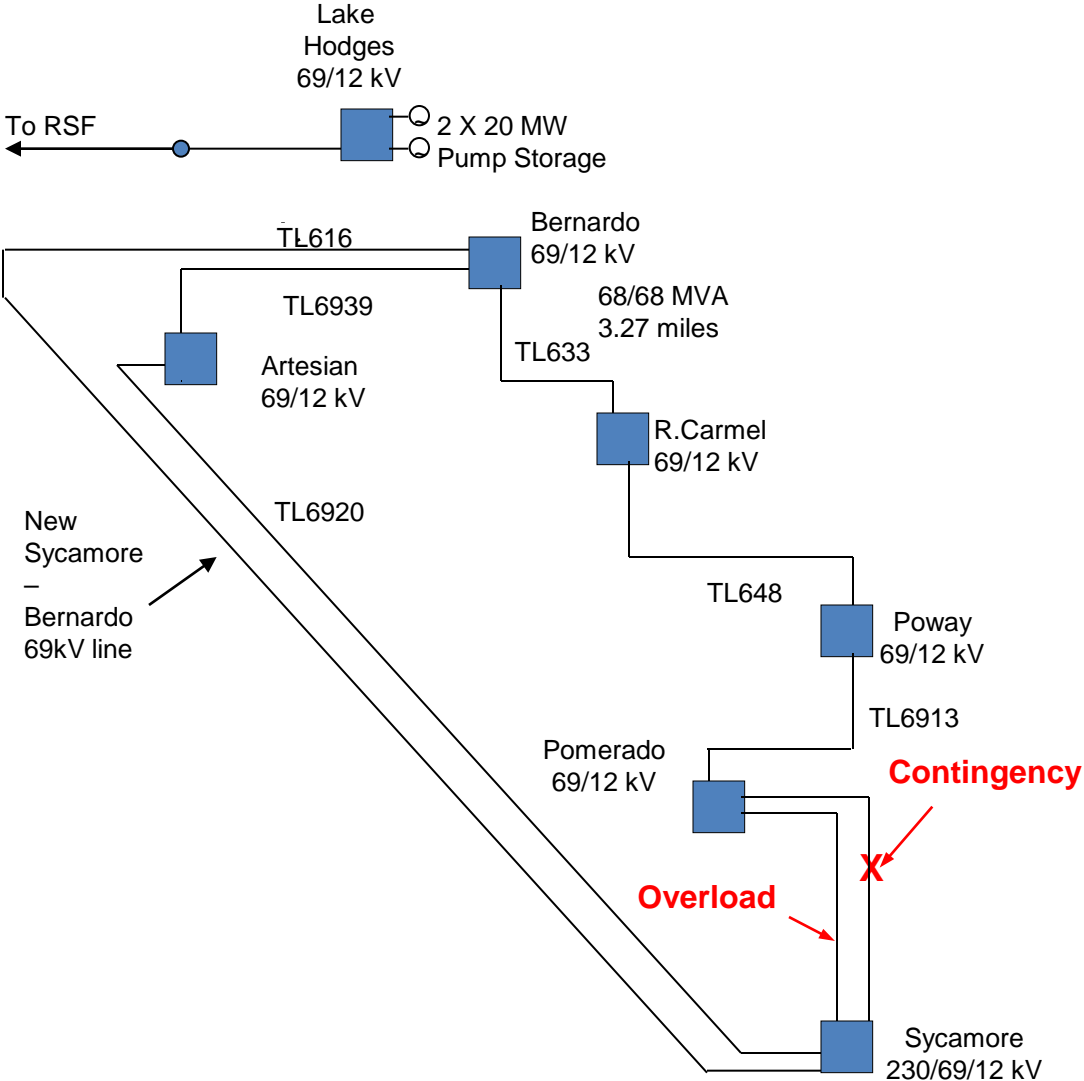
SDG&E Area – Results

- Thermal Overloads

- TL 6915 and 6924, Pomerado – Sycamore 69kV line #1 and #2 (2022 ~)

- Potential Mitigation

- Re-evaluate in future planning cycles



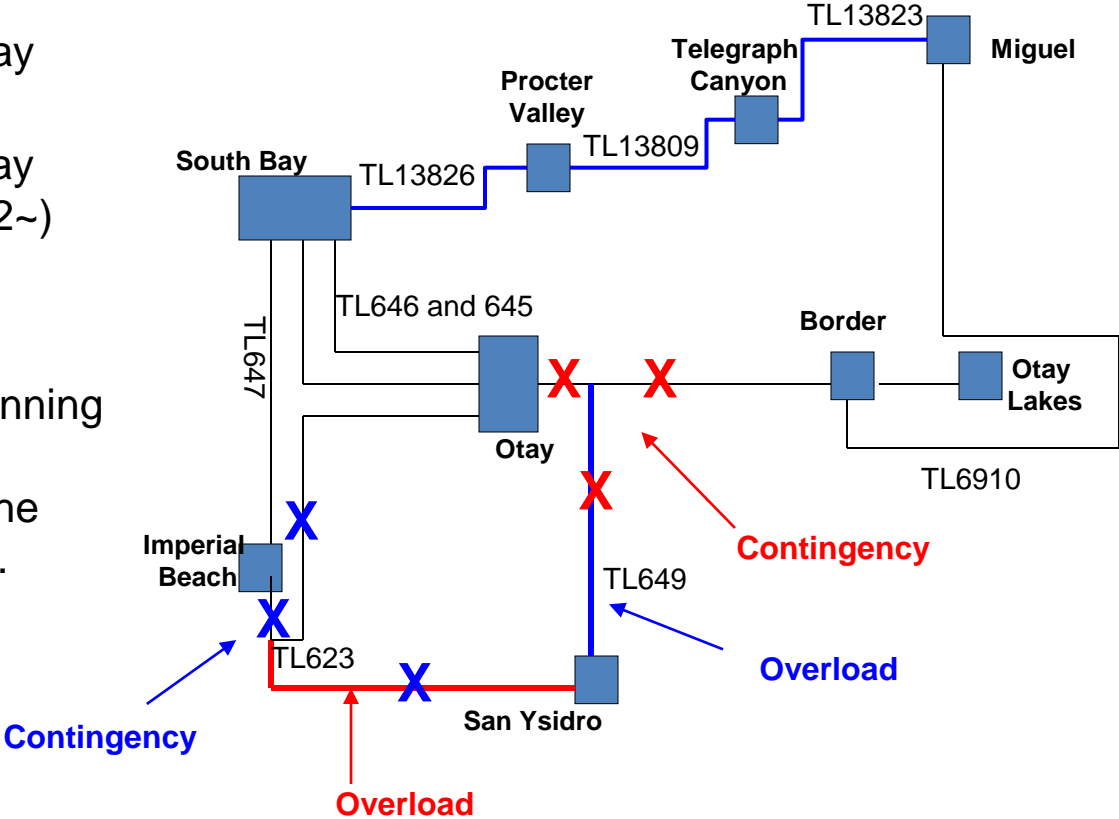
SDG&E Area – Results

- Thermal Overloads

- TL 623, San Ysidro – Otay Tap 69kV line (2022 ~)
- TL 649, San Ysidro – Otay Lake Tap 69kV line (2022~)

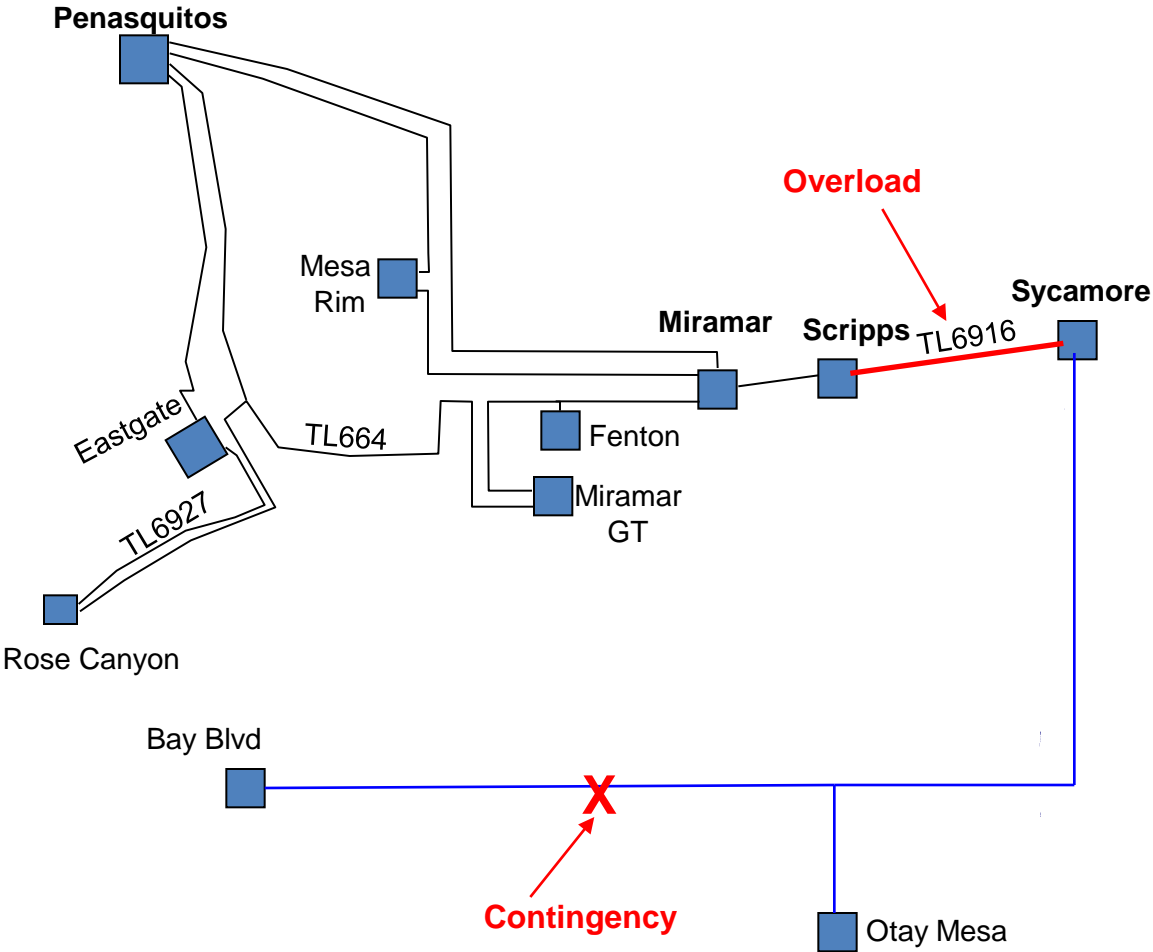
- Potential Mitigation

- Re-evaluate in future planning cycle. Reconfigure / reconductor facilities in the metro area 69kV system.



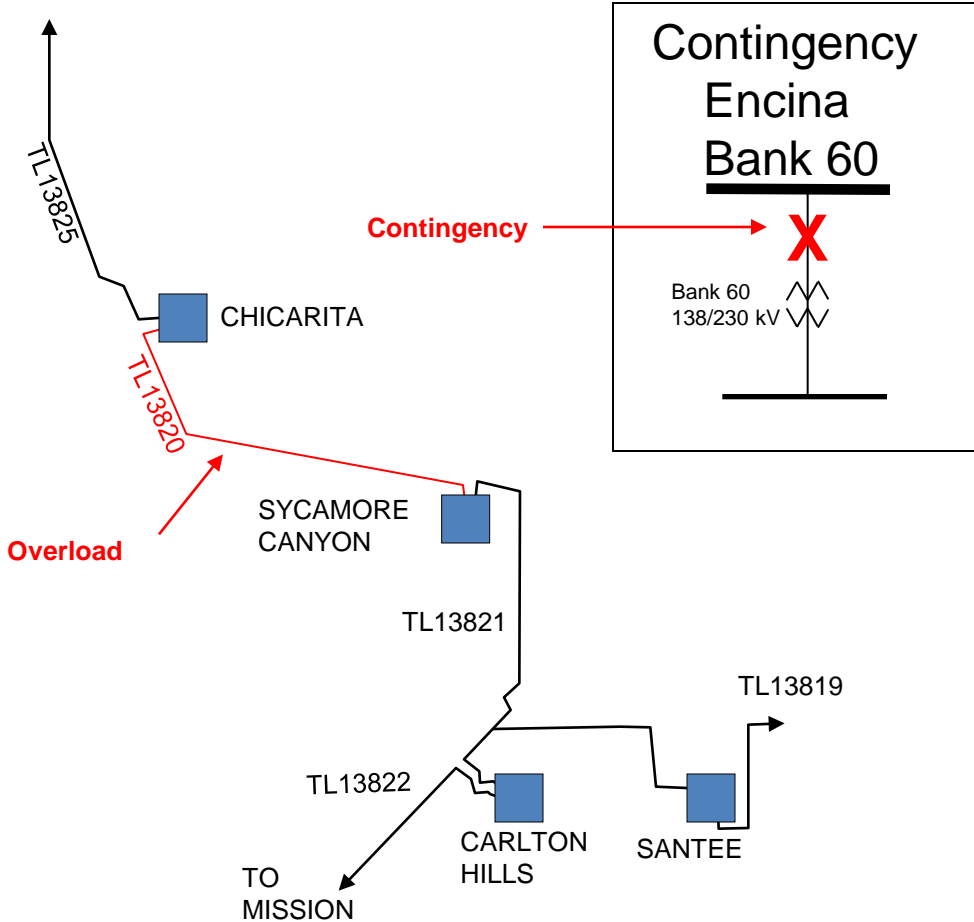
SDG&E Area – Results

- Thermal Overloads
 - TL 6916, Sycamore – Scripps 69kV line (2014 ~)
- Potential Mitigation
 - Generation re-dispatch or Reconductor



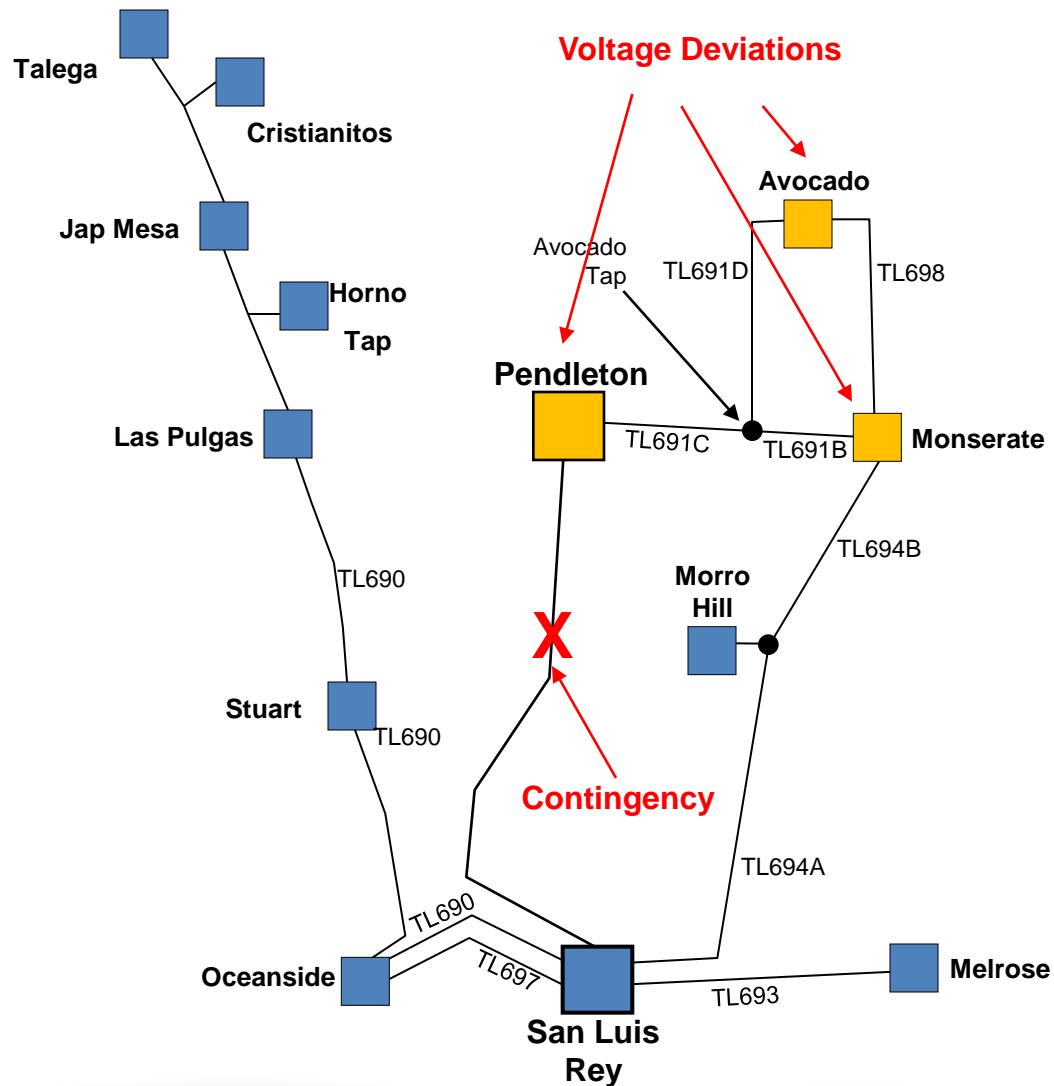
SDG&E Area – Results

- Thermal Overloads
 - TL 13820, Sycamore – Chicarita 138kV line (2022 ~)
- Potential Mitigation
 - Generation re-dispatch or Reconductor



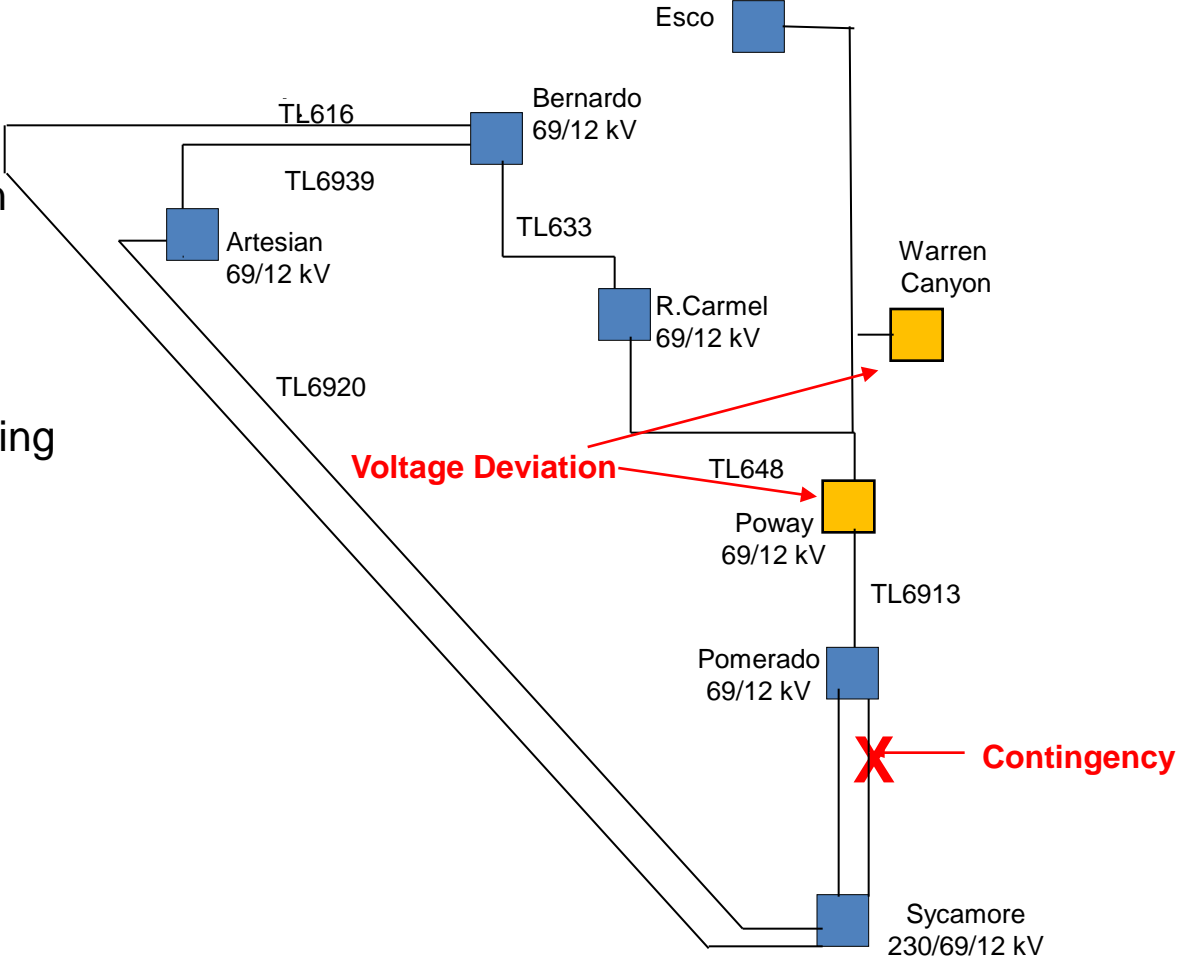
SDG&E Area – Results

- Voltage Deviation
 - 69kV system in Pendleton – Pala area (2014 ~)
- Potential Mitigation
 - Upgrade the 69kV system in Pendleton-Pala area and/or change transformer tap settings at San Luis Rey and Escondido. Put distribution caps at Pendleton, Avocado and Monserate in automatic mode.



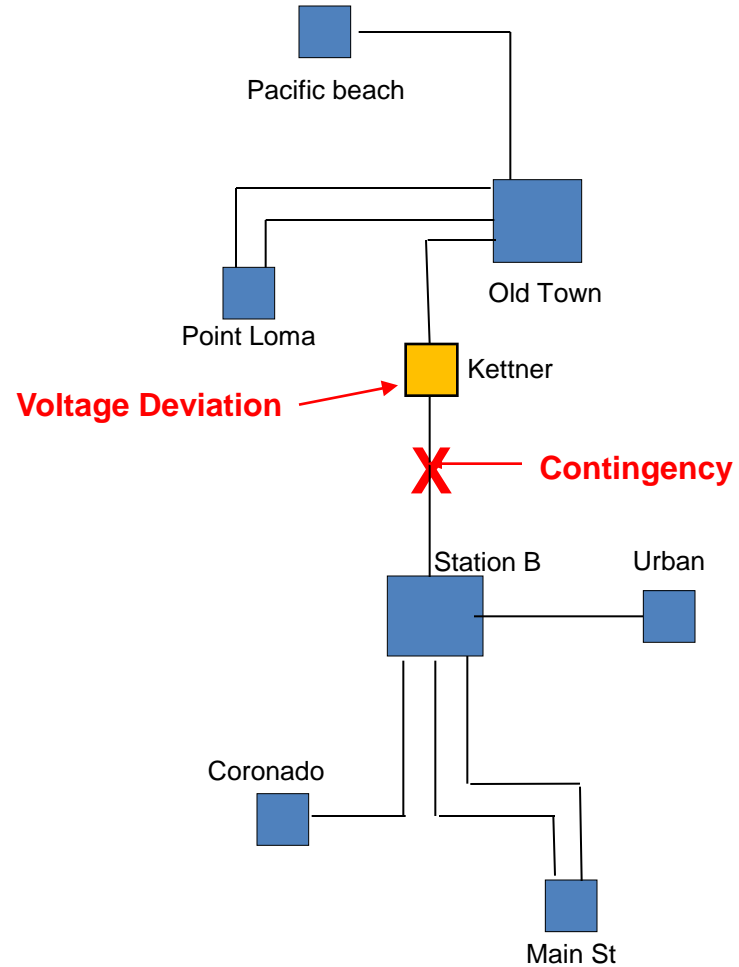
SDG&E Area – Results

- Voltage Deviation
 - Poway and Warren Canyon 69kV (2022 ~)
- Potential Mitigation
 - Re-evaluate in future planning cycles



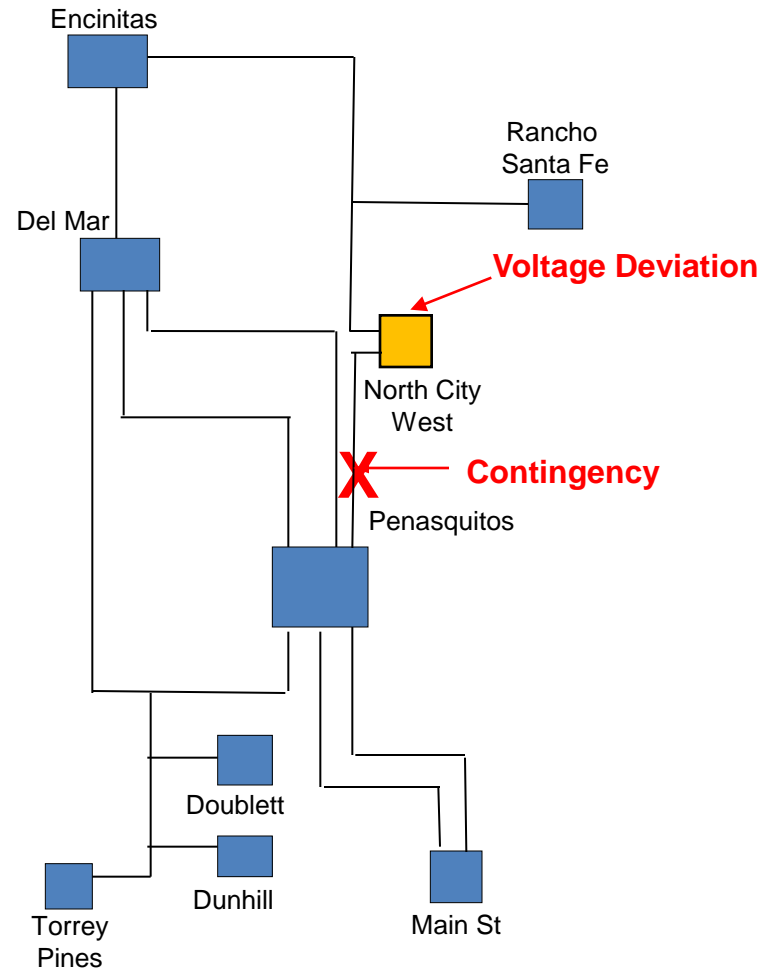
SDG&E Area – Results

- Voltage Deviation
 - Kettner 69kV (2022 ~)
- Potential Mitigation
 - Re-evaluate in future planning cycles



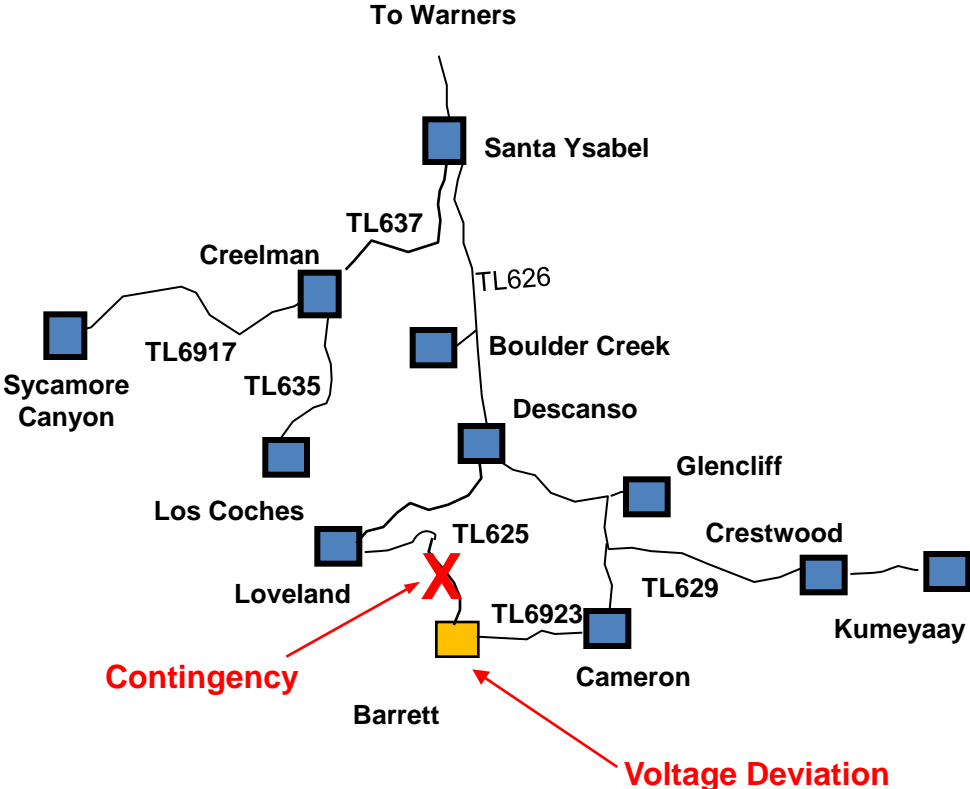
SDG&E Area – Results

- Voltage Deviation
 - North City 69kV (2017 ~)
- Potential Mitigation
 - Add dynamic reactive support and/or put distribution caps at North City West in automatic mode.



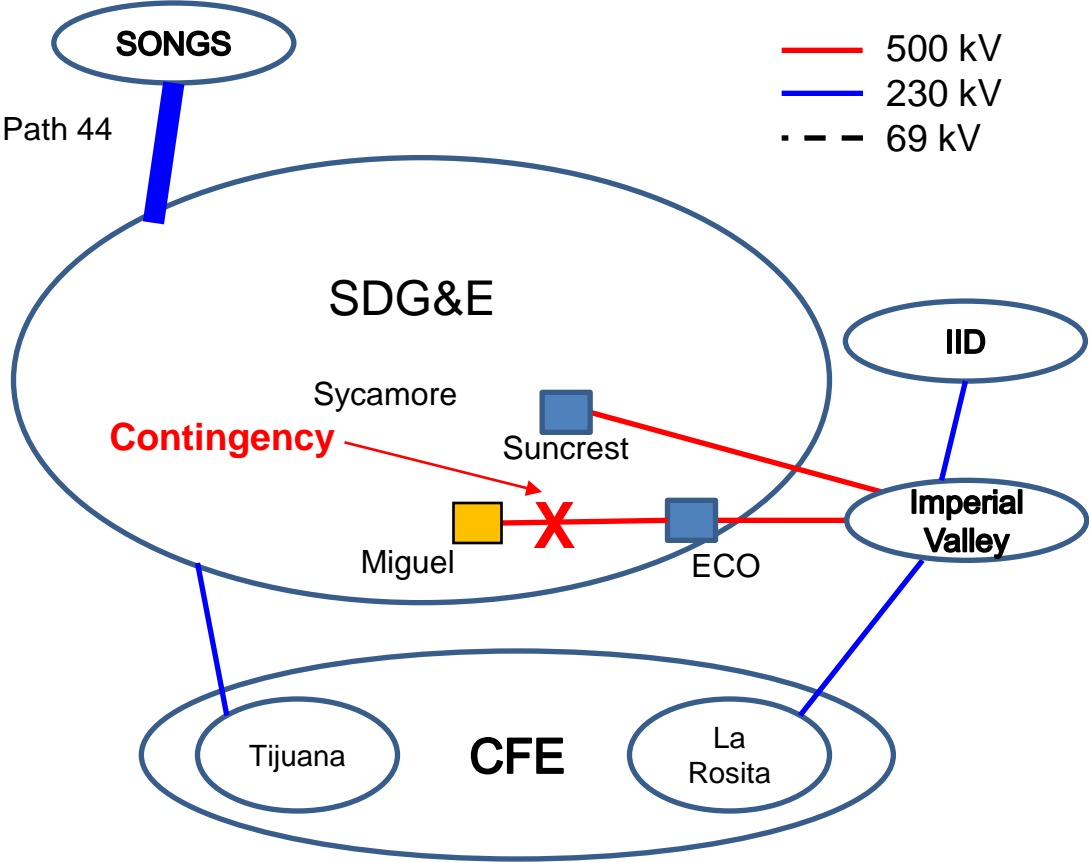
SDG&E Area – Results

- Voltage Deviation
 - Barrett 69kV (non-peak 2022~)
- Potential Mitigation
 - Re-evaluate in future planning cycles



SDG&E Area – Results

- Post-Transient Voltage Stability
 - Voltage deviation at Miguel 500 and 230kV buses (< 6% deviation observed)
- Potential Mitigation
 - Operate SVDs and distribution caps at Miguel in automatic mode and/or
 - Additional dynamic reactive support **in Miguel area**

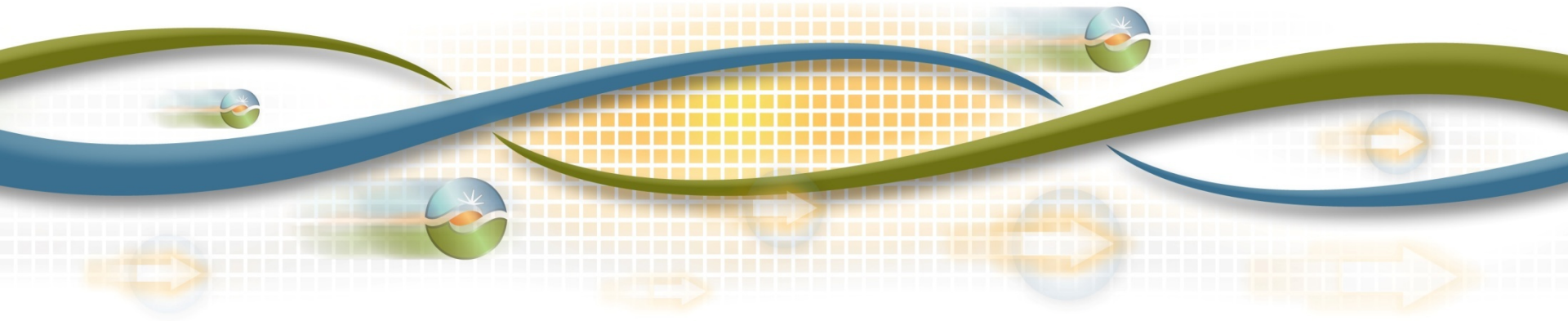


L.A. Basin and San Diego Area Local Reliability Assessment Results – 2013 Summer Contingency Planning without SONGS

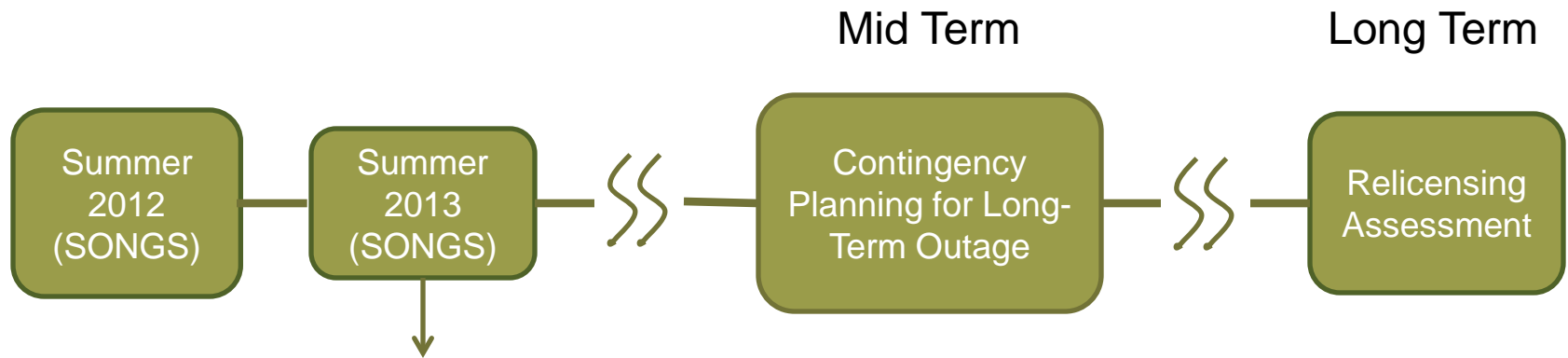
David Le

Senior Advisor - Regional Transmission Engineer

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



Study Efforts for Nuclear Generation Backup Plan



2013 contingency plan without SONGS completed in August 2012

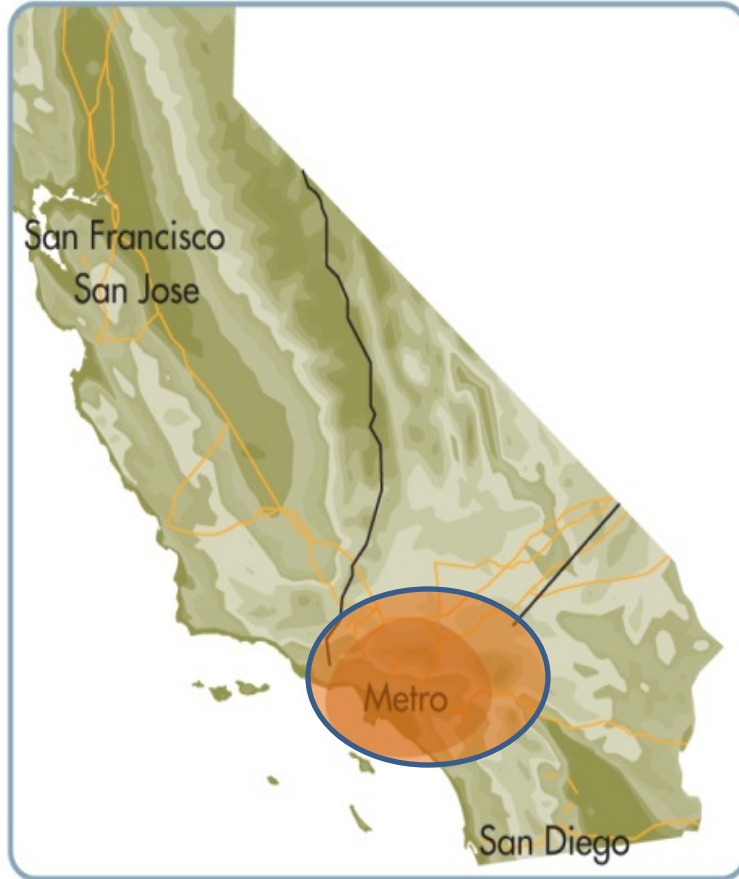
“Least regrets” approach and objectives:

- Maintain reliability
- Timely
- Consistent with longer-term needs
- ***Robust plan to avoid reliance on SPS load shedding associated with Category C (L-1-1) contingency in high density population areas***

Addendum to the 2013 Local Capacity Technical Analysis Report – SONGS absence scenario

- The ISO posted the addendum to the 2013 LCTA report on August 20, 2012
(http://www.caiso.com/Documents/Addendum-Final2013LocalCapacityTechnicalStudyReportAug20_2012.pdf)
- The ISO also scheduled and held a stakeholder conference call on August 29, 2012 to discuss the addendum report and mitigation measures.
- In this meeting (transmission planning process stakeholder meeting), the ISO will not discuss the above items as they were discussed and addressed at the stakeholder conference call on August 29, 2012. However, the ISO will discuss identified reliability concerns and needed transmission mitigation measures.

L.A. Basin Area



- Includes ISO's portion of Los Angeles, Orange, Riverside and San Bernardino Counties
- Generation: 9,916 MW (Net Qualifying Capacity value)
- Comprised of 115, 230 & 500 kV transmission facilities
- Summer Peak Load (1-in-10 heat wave forecast): 20,460 MW in 2013

L.A. Basin Area Assessment Summary

- The assessment identified:
 - Thermal overloads (summer peak) due to Category C - 1
 - Post-transient voltage instability (summer peak) due to Category C – 1
 - Post-transient low voltages (summer peak) due to Category C – 9
 - Post-transient voltage deviation (summer peak) due to Category C – 2

L.A. Basin Area Proposed Solutions

- Proposed Mitigation Solutions
 - Reconfigure two existing Barre – Ellis 230kV lines to four lines
 - Convert Huntington Beach Units 3 and 4 from generating units to two 140 MVAR synchronous condensers for voltage support
 - Install one 79.2 MVAR shunt capacitor each at Johanna and Santiago 230kV Substations; two 79.2 MVAR shunt capacitors at Viejo 230kV Substation

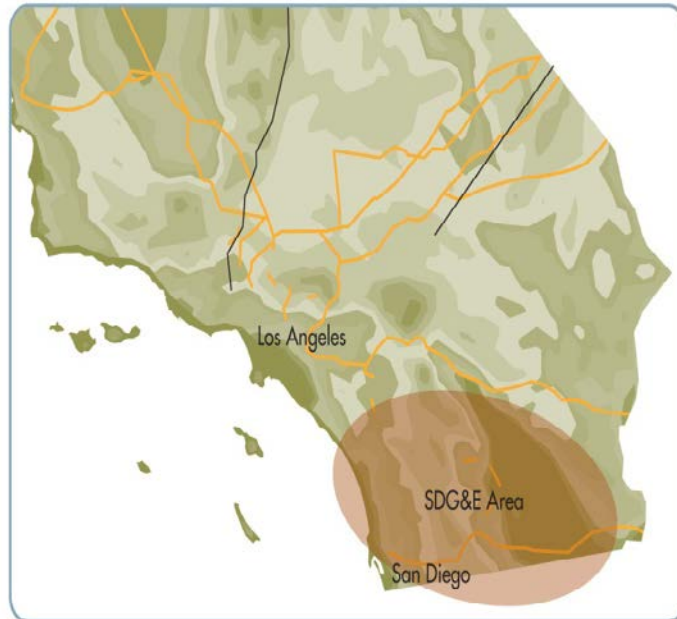
L.A. Basin Area – Results



L.A. Basin Area – Results (cont'd)

- Thermal Overloads
 - Barre – Ellis 230kV line (2013)
- Voltage Deviation
 - Viejo 230kV and 66kV (2013)
- Low Voltages
 - San Onofre 230kV switchyard (2013)
 - Chino, Johanna, Lewis, Padua, Santiago, Serrano, Viejo, Villa Park 230kV substations
- Proposed Mitigation
 - Reconfigure Barre-Ellis 230kV lines
 - Convert Huntington Beach Units 3&4 to synchronous condensers (2-140 MVAR)
 - Install 1-79 MVAR shunt capacitors (each) at Johanna and Santiago
 - Install 2-79 MVAR shunt capacitors at Viejo, OR, 1-79 MVAR shunt capacitor at Viejo and 1-79 MVAR at Talega Substation (Talega is SDG&E-owned substation)

San Diego/Imperial Valley Area



- Includes San Diego and a portion of (southern) Orange County
- Generation: 3,069 MW (San Diego area) and 1,080 MW (connected at Imperial Valley substation)
- Comprised of 69, 138, 230 & 500 kV transmission facilities.
- Summer Peak (1-in-10 heat wave forecast): 5,124 MW in 2013

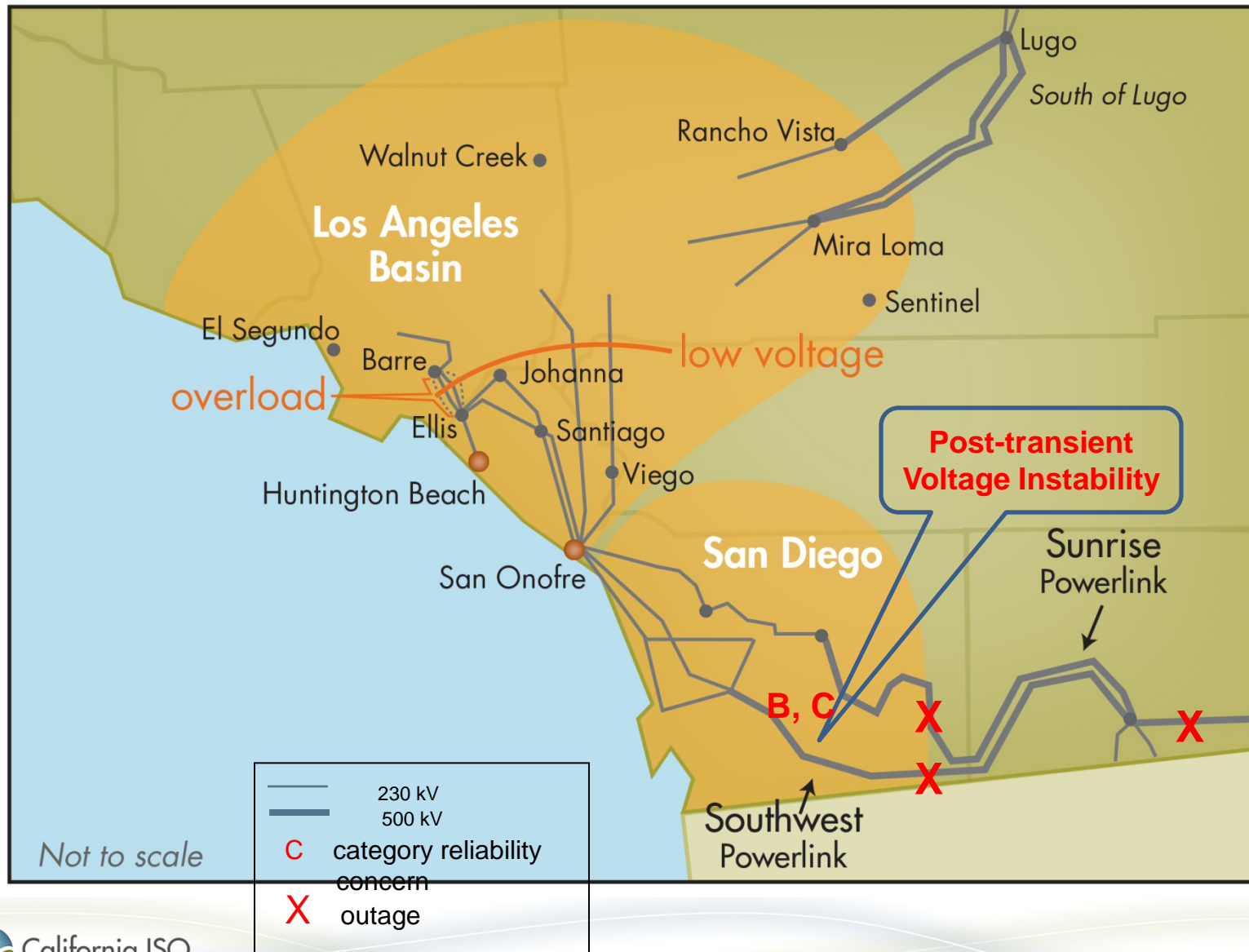
San Diego/Imperial Valley Area Assessment Summary

- The assessment identified:
 - Post-transient voltage instability (summer peak) due to Category B – 1 and Category C - 1

Proposed Solutions for San Diego/Imperial Valley Area Assessment

- Proposed Mitigation Solutions
 - For mitigating Category B voltage stability concerns, the existing generation is adequate.
 - For mitigating Category C voltage stability concerns, additional reactive support additions identified in the L.A. Basin area are needed:
 - Convert Huntington Beach Units 3 and 4 from generating units to two 140 MVAR synchronous condensers for voltage support

San Diego/Imperial Valley Area – Results



San Diego/Imperial Valley Area – Results (cont'd)

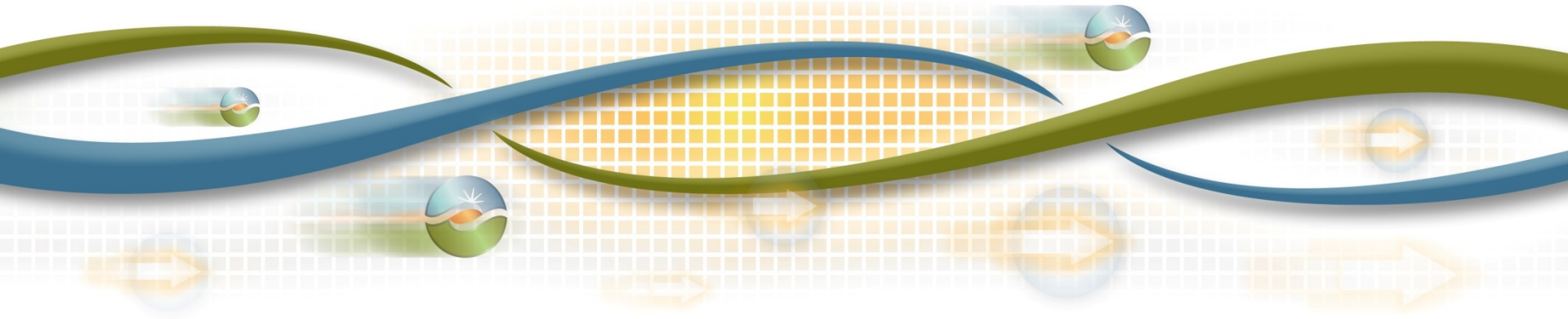
- Post-transient voltage instability
 - San Diego/Imperial Valley area
- Proposed Mitigation
 - Convert Huntington Beach Units 3 & 4 to synchronous condensers (2-140 MVAR)

Other Non-Transmission Alternatives

Neil Millar

Executive Director - Infrastructure Development

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



What is the issue?

- ISO processes are intended to address non-transmission alternatives.
- Want to ensure that the opportunities for suggesting alternatives is clear
- Want to ensure that the methodology for comparable evaluation is also clear

Opportunities for input to ISO about Non-transmission Alternatives

- Programs and alternatives providing necessary location specificity, operating characteristics and certainty can be suggested through stakeholder comments
- Comments on Unified Planning Assumptions
 - Especially load forecast-related (energy efficiency)
- Comments on reliability needs and proposals for non-transmission alternatives
 - Window on comments closes October 15
- Comments on policy and economic evaluation results – in December

How are non-transmission alternatives already being considered today?

- Energy Efficiency
 - Forecasts of the impacts of committed programs are embedded in CEC forecasts
- Demand Response Program
 - Currently no basis for including any existing Demand Response programs in forecasts or as a mitigation
- Combined Heat and Power
 - Baseline forecasts are included in CEC forecasts
- Distributed generation
 - Base behind the meter amounts included in CEC forecasts
 - Utility-connected distributed generation from CPUC/CEC-provided renewable generation portfolios currently difficult to model due to lack of certainty about location

Others?

- Other non-transmission alternatives can also be suggested through the stakeholder comment periods, e.g.:
 - Energy storage
 - Note energy storage alternatives have been suggested and studied in the past
 - New generation/technologies
 - Other?

How are proposed non-transmission alternatives evaluated?

- ISO relies on transmission planning standards to test effectiveness of proposed alternatives
- ISO uses financial analysis relying on the established methodologies going to the level of detail necessary.

Implementation Considerations

- The ISO context differs from the old integrated utility context
- the ISO has no ability or authority to ensure that any proposed non-wires alternative is actually implemented
- Due to the generally longer time it takes to implement transmission than any alternative, combined with our responsibility for reliable operation of the grid, we can only defer acting on a needed transmission upgrade (at least ones needed for reliability) in favor of an NWA when there's confidence in the commitment that the NWA will actually materialize on time.
- Non-wire alternatives need to consider addressing these concerns

Next Steps

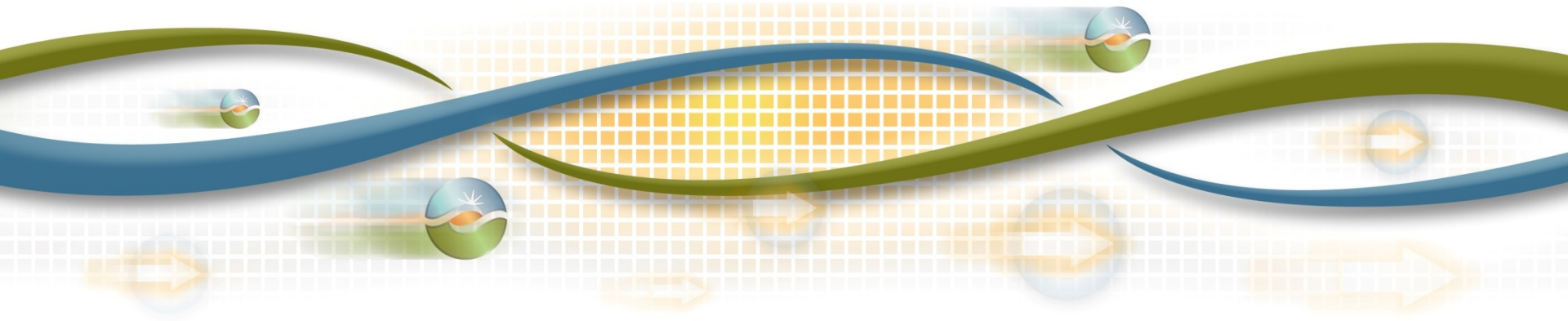
- ISO looking to examine non-transmission alternatives from other jurisdictions and the frameworks used consider comparative benefits
- Examine any proposed non-transmission alternatives in the 2012/13 planning cycle
- Look for stakeholder feedback in responding to this presentation
- Provide more feedback and discussion at December 2012 stakeholder consultation session

Next Steps

Neil Millar

Executive Director - Infrastructure Development

2012/2013 Transmission Planning Process Stakeholder Meeting
September 26-27, 2012



Next Steps

Date	Milestone
September 27	PTO presentations on mitigation solutions
September 27- October 11	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 31	Post final 2012/2013 reliability study results