CTPG Stakeholder Meeting
Part 1 - Phase 1 Study Results
Part 2 - Next Iteration Discussion

1/20/10

Agenda

Part 1

Meeting Introduction	10:00 – 10:10	Facilitator
Review Study Objectives and Scope	10:10 – 10:20	Mo Beshir
Review Input Assumptions and Dispatch Methodology	10:20 – 10:50	Tim Wu / Jan Strack
Case A Results	10:50 – 11:00	Patrick Truong
Case B Results	11:00 – 11:10	Ly Le / Patrick Truong
Case C Results	11:10 – 11:20	Jan Strack
Case L Results	11:20 – 11:30	Tariq Niazi
Results Summary	11:30 – 12:00	Mo Beshir
Lunch	12:00 – 1:00	

Part 2

CTPG Next Phase Overview	1:00 – 1:15	Heather Sanders
Next Iteration Stakeholder Input	1:15 – 3:55	Mike Deis
Meeting Wrap-up	3:55 – 4:00	Mo Beshir

Meeting Introduction

STUDY OBJECTIVES AND SCOPE

CTPG Background

- Forum for conducting state-wide joint transmission planning
- Will be conducting annual studies to address transmission system issues in California
- 2009-10 study focus is on the state's renewable development goals
- Committed to developing a California state-wide transmission plan to meet the state's 33% renewable goal by 2020
- Recognizes that it would require several study iterations to develop the final conceptual transmission plan

Study Objectives

- Develop first iteration for statewide plan to meet 33% renewable generation goals
- Employ and be consistent with RETI results
- Coordinate with existing utility plans
- Identify potential changes to RETI conceptual transmission plan
- Conduct the studies in a timely fashion to support other planning activities

Scope Objectives

- This study phase does:
  - Include significant groundwork to construct accurate benchmark cases representing year 2020
  - Develop additional tools for future scenarios
  - Provide results based on grid performance with expected simultaneous output of renewables for specific on- and off-peak hours in year 2020
- This study phase does not:
  - Determine a FINAL transmission plan
  - Base results on “deliverability” methodology:
    - all renewables at resource adequacy capacity output levels
    - imports into a control area fixed at historical levels
  - Specifically focus on Once Through Cooling (OTC) impacts

Study Scope

- Case A: 2020 Northern California adverse peak weather (90/10)
  - How much additional transmission is needed during a northern CA 1 in 10 peak to achieve 33% goals assuming high imports from the Pacific Northwest
- Case A-SN (South- North) Sensitivity to Case A
  - How much additional transmission is needed during high S-N flows
- Case B: 2020 Southern California adverse peak weather (90/10)
  - How much additional transmission is needed during a southern CA 1 in 10 peak to achieve 33% goals without predetermining import flows
- Case C: 2020 (50/50) expected peak weather
  - Designed to evaluate capability of existing and planned grid
- Case L: 2020 Light Load
  - Assess the California's transmission needs under light loads conditions
- Other cases under consideration include Spring/Autumn seasons, off-peak hours, Once-Through-Cooling impact, and different import levels
- Adhere to NERC, WECC, and each Member's Reliability Criteria

STUDY METHODOLOGY AND INPUT ASSUMPTIONS

Study Case Methodology

- Step 0: Develop Benchmark Base Case:
  - Reflect the 2020 system for each scenario
  - WECC 2019 Heavy Summer case as seed case (includes Sunrise, Tehachapi 1-11, Colorado River-Devers-Valley, GPN, Barren Ridge)
  - WECC 2019 Heavy Winter case as seed case for L0
  - Update CA peak demand according to the scenario
  - Maximize power transfers from Pacific Northwest in A0 case
  - Perform detailed contingency analysis to meet reliability criteria
- Step 1: Add Renewable Projects at 0 MW/ MVAR output
  - Modify grid to provide CREZ connections
  - Case A1, B1, and L1: add major projects from RETI conceptual transmission plan (e.g., southern Nevada-Kramer-Los Angeles basin, Carrizo, Owens Valley upgrades)
  - Case C1: add selected RETI upgrades (e.g., Carrizo, Owens Valley upgrades)
  - Perform detailed contingency analysis to meet reliability criteria
- Step 2: Dispatch renewable generation in increments offset by equal decrements of fossil generation
  - Perform detailed contingency analysis to meet reliability criteria
  - Identify and review limiting constraints or violations

Input Assumptions Overview

- Baseline grid configuration from 2019 WECC "Heavy Summer" power flow case
- Peak Demand forecasts for 2020 case provided by load serving entities
- Renewable Energy Planning Target updated for CEC's adopted 2009 IEPR retail sales forecast
- Renewable generation portfolios provided by load serving entities
- RETI Phase 2A results as detailed on following slides

CTPG's 2020 Planning Target

	CTPG (GWh)	RETI– Phase 2A (GWh)
Forecast Retail Load subject to California's renewable goals:	289,697	301,974
Renewable Portfolio Standard (RPS) Goal:	33%	33%
Renewable Portfolio Standard (RPS) Energy Requirement:	95,600	99,651
Existing and New Renewables expected to be on line by end of 2009:	39,324	36,807
Miscellaneous renewable resource additions:	2,670	3,134
subtotal:	41,995	39,941
"Net Short":	**53,605**	**59,710**
Identified Renewable Resource Additions:	55,535	95,536*
Total Renewable Energy Production:	**97,529**	**135,477***
Identified Renewable Energy as a Fraction of Retail Sales:	**33.7%**	**44.9%***

*For purposes of developing a conceptual transmission plan that addresses uncertainties in the location of renewable resource development, RETI planned for renewable resource additions equal to approximately 1.6 times the RETI net short.

Year 2020 Peak Demand

- Each load serving entity provided peak demand forecasts for their service territory

Area	LOAD (MW)		
	Off-Peak[1]	1-in-2-year	1-in-10-year
SDG&E	2,776	4,913	5,374
LADWP[2]	3,263	6,293	6,816
IID	608	1,246	1,280
SCE[3]	10,302	25,573	27,540
PG&E[3]	11,613	26,168	27,221
SMUD	1,293	3,182	3,634
TID	252	683	700
Total	**30,107**	**68,058**	**72,565**

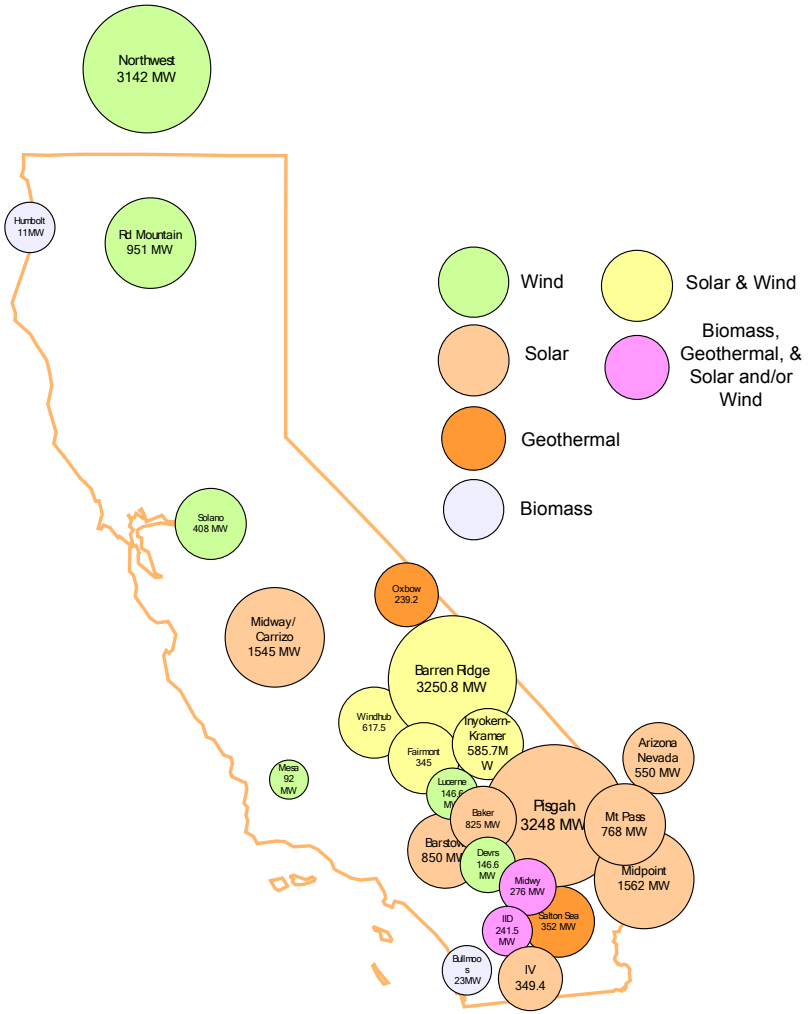
[1] Off-Peak Load represents a Light Spring condition developed from 65% of the Heavy Winter WECC 2019 Case

[2] LADWP includes Burbank and Glendale

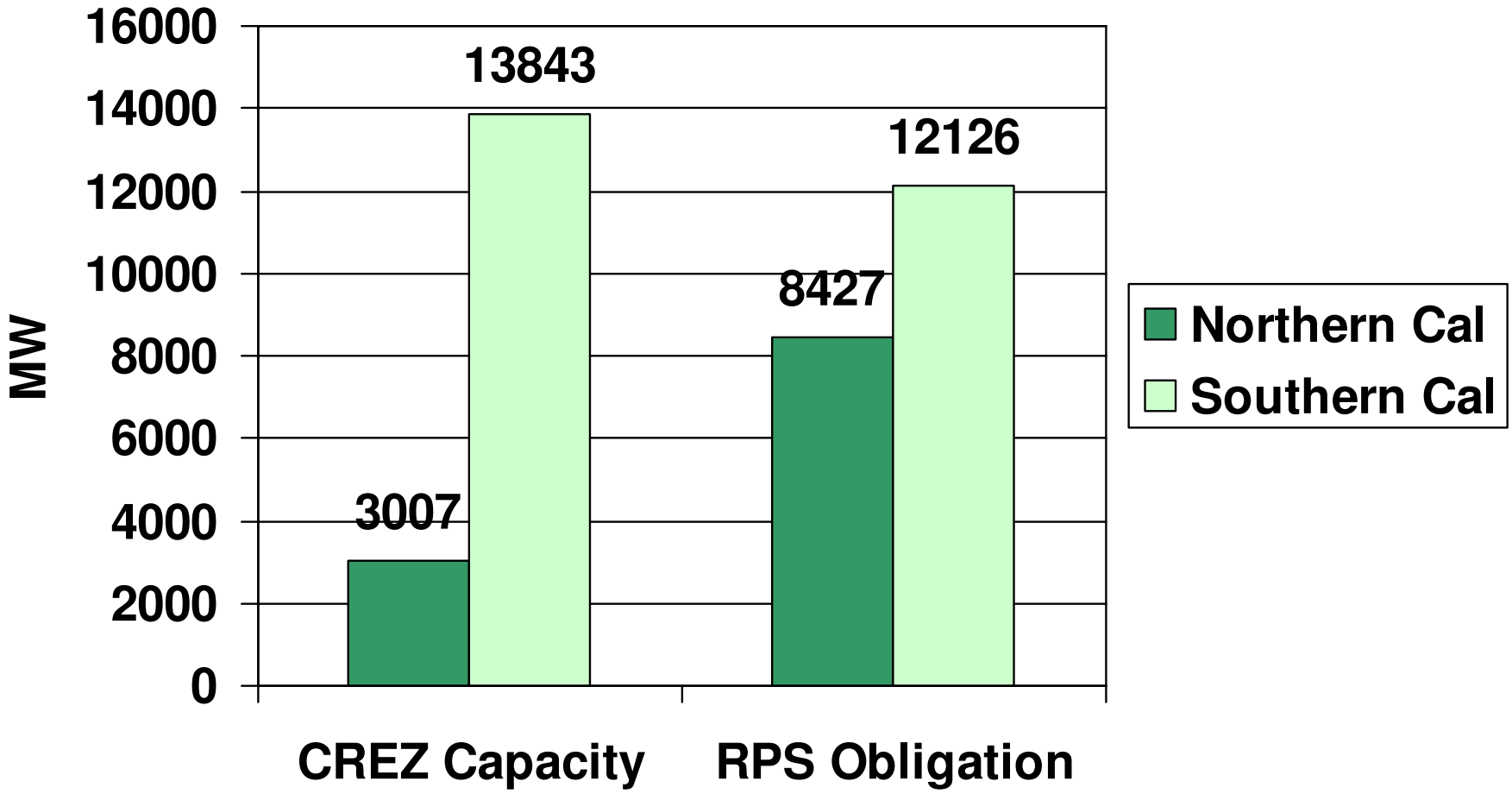
[3] SCE and PG&E includes other Munis

Renewable Generation Portfolio

- Each utility provided renewable procurement plans reflecting installed capacity, and in some cases the expected renewable dispatch at time of peak
- In other cases CTPG used generic factors to relate nameplate capacity to expected renewable dispatch for the hour of study (e.g., peak hour, off-peak hour)
- RETI's CREZ- and technology-specific annual capacity factors used to estimate renewable energy potential
- Rooftop PV and other distribution-level generation was considered as a reduction to load



CREZ Capacity vs. RPS Obligation



Renewable Generation

	CTPG		RETI*	
Location (Region/CREZ)	Installed Capacity (MW)	Identified Annual Renewable Energy Production (GWh)	Maximum Potential Installed Capacity adjusted for success rate (MW)	Identified Potential Annual Renewable Energy Production adjusted for success rate (GWh)
British Columbia	0	0	340	1849
Washington	963	2594	0	0
Montana	413	1111	N/A	N/A
Idaho	130	350	N/A	N/A
Oregon	1637	4408	392	3062
Round Mountain-A	0	0	101	710
Round Mountain-B	78	319	49	196
Lassen North	873	2262	387	999
Lassen South	0	0	108	292
Nevada N	0	0	115	822
Nevada C	239	1886	352	2624
Nevada S	217	502	N/A	N/A
Owens Valley	0	0	370	954
Inyokern	242	467	642	1669
Kramer	344	988	1693	4370
Mountain Pass	768	1777	438	1145
San Bernardino - Baker	825	1870	969	2299
Barstow	850	1985	617	1546
Pisgah	3248	7763	673	1658
San Bernardino - Lucerne	174	560	800	2150
Twentynine Palms	0	0	477	1219
Victorville	0	0	432	1128
Tehachapi	3868	10189	5514	15716
Fairmont	345	862	929	2734

Renewable Generation (Continued)

	CTPG		RETI*	
Location (Region/CREZ)	Installed Capacity (MW)	Identified Annual Renewable Energy Production (GWh)	Maximum Potential Installed Capacity adjusted for success rate (MW)	Identified Potential Annual Renewable Energy Production adjusted for success rate (GWh)
Needles	0	0	122	313
Iron Mountain	0	0	1297	3065
Arizona	333	740	0	0
Riverside East	1562	3471	2785	6725
Palm Springs	147	500	203	685
Imperial North-A	352	2775	1370	10626
Imperial North-B	*386*	*1843*	483	1190
Imperial South	*466*	*1091*	981	2420
Imperial East	15	43	429	1045
Baja-B (Santa Catarina)	0	0	2632	8931
Baja-A (La Rumorosa)	0	0	2368	8035
San Diego South	0	0	179	508
San Diego North Central	0	0	74	195
San Diego	23	171	N/A	N/A
Humboldt	11	82	N/A	N/A
Solano	408	1248	236	756
Cuyama	0	0	211	471
Carrizo North	0	0	422	896
Carrizo South	1545	3429	1024	2197
Santa Barbara	92	249	114	312
Total	**20553**	**55535**	**30327**	***95536***

* For purposes of developing a conceptual transmission plan that addresses uncertainties in the location of renewable resource development, RETI planned for renewable resource additions equal to approximately 1.6 times the RETI net short.

Transmission Projects in Base Case

- Transmission upgrades in the 2019 Heavy Summer and Heavy Winter WECC Base Cases
  - SCE's Tehachapi Segments 1-3
  - SDG&E's Sunrise Powerlink
  - SCE's Tehachapi Segments 4-11
  - SCE's 500 kV Colorado River-Devers-Valley project
  - LADWP's/IID's 500 kV Green Path North project
  - LADWP's Barren Ridge/Haskell Canyon/Rinaldi upgrades
  - IID's upgrade of Ramon-Devers and Coachella Valley-Devers

Transmission Projects in Case A1, B1, and L1

- Transmission upgrades added to Cases A1, B1, and L1 (see attachment for list of all grid modifications and upgrades)
  - Reconductor Morro Bay-Midway #1, 2 & Morro Bay-Gates #1
  - Rebuild SCE's 115 kV Owens Valley-Inyokern-Kramer system with 230 kV
  - 500 kV El Dorado-Mountain Pass-Baker-Barstow line
  - 500 kV Barstow-Lugo #1
  - 500 kV Pisgah-Barstow #1 (L1 only)
  - 500 kV Pisgah-Lucerne #1 (L1 only)
  - 500 kV Pisgah-Mira Loma #1 (L1 only)

Transmission Projects in Case A-SN

- Transmission upgrades added to Case A-SN (see attachment for list of all grid modifications and upgrades)
  - C3ET Project (Alternative 2D) New Gregg 500 kV substation, two Gregg 500/230 kV transformers, new 500 kV line double circuits from Gregg 500 kV substation to Midway 500 kV substation with 50% series compensation.
  - Gregg-Bay Area-Sacramento project: New Warnerville 500 kV substation and new Rancho Seco 500 kV substation, new Gregg - Warnerville and Gregg – Rancho Seco 500 kV lines with 50% series compensated, 230/500 kV transformers at Warnerville and Rancho Seco.
  - Warnerville - Tesla 500 kV line (case A2SN-TEWA only)
- Recommend additional transmission upgrades to be added (based on the case A2-SN study results)
  - Upgrade Path 26 S-N
  - Re-conductor the Los Banos–Westley 230 kV line

Transmission Projects in Case C1

- Transmission upgrades added to Case C1 (see attachment for list of all grid modifications and upgrades)
  - Reconductor Morro Bay-Midway #1 and 2
  - Rebuild SCE's 115 kV Owens Valley-Inyokern-Kramer system with 230 kV
- Incremental renewable dispatch to evaluate existing and planned grid capability

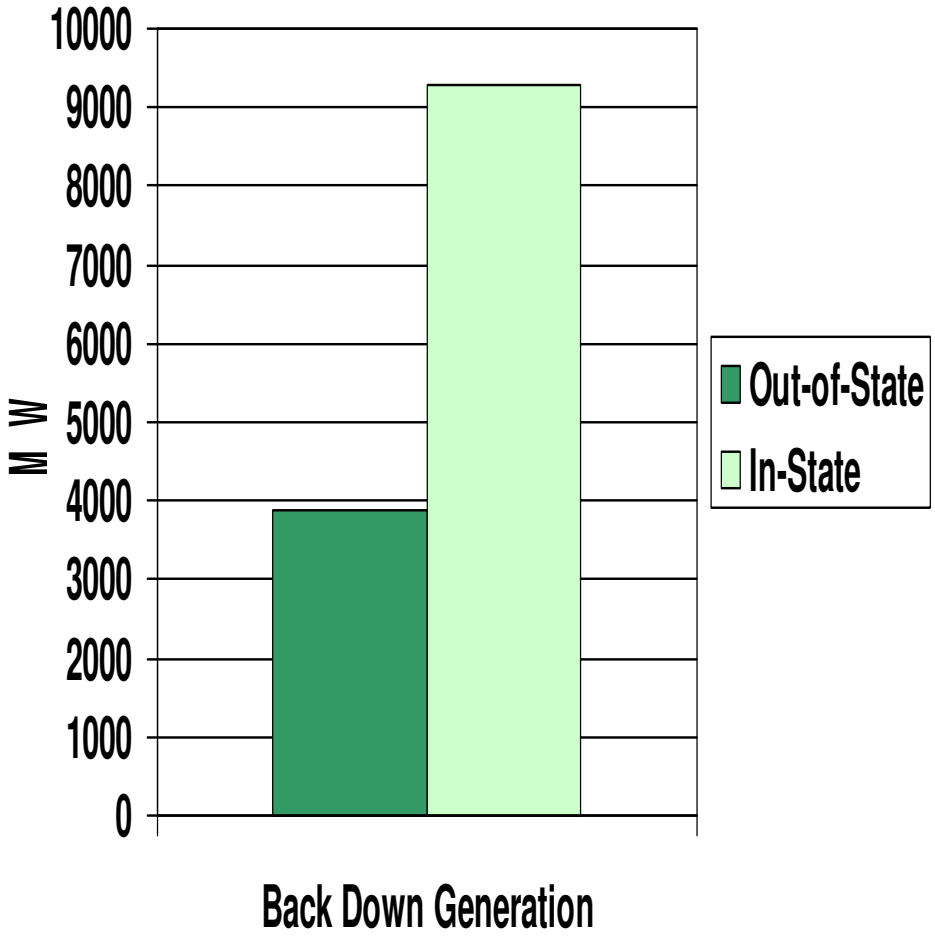
Dispatch Methodology

- Objective is to reduce fossil generation to allow for renewable dispatch to meet 33% goal
- Fossil Generation reduced in blocks, equal increments of renewable generation
- 70/30 split between California fossil generation and out-of-state fossil generation
- Decrementing done in a merit-order fashion (least economic reduced first) with heat rate data used for economic ranking from the latest TEPPC 2017 economic database

Example

- Units in the each 1000 MW blocks are decremented equally until all units in the block are turned off.
- Decrements between minimum output level and 0 MW not allowed; i.e., unit is turned off
- The units in the next block are then reduced in the same fashion, and so on.
- Nuclear and hydro units are not decremented in the summer peak cases.

Back Down Generation



Area	MW	%
Out-of-State	3890	29.5%
In-State	9275	70.5%
Total	13165	100%

Dispatchable Fossil Units

Unit Type	MW Dispatchable	Dispatch %
Internal Units	**36,241**	**70%**
California Gas Turbines (FLHR > 10,000 BTU/kWh)	4,195	
California Gas-Fired Steam Units (FLHR > 10,000 BTU/kWh)	6,697	
California Gas Turbines (FLHR < 10,000 BTU/kWh)	25	
California Gas-Fired Steam Units (FLHR < 10,000 BTU/kWh)	7,414	
California Combined-Cycle Units (FLHR > 9,000 BTU/kWh)	0	
California Combined-Cycle Units (FLHR < 9,000 BTU/kWh)	17,910	
External Units	**51,119**	**30%**
External Gas Turbines (FLHR > 10,000 BTU/kWh)	8,983	
External Gas-Fired Steam Units (FLHR > 10,000 BTU/kWh)	5,362	
External Gas Turbines (FLHR < 10,000 BTU/kWh)	1,686	
External Gas-Fired Steam Units (FLHR < 10,000 BTU/kWh)	859	
External Combined-Cycle Units (FLHR > 9,000 BTU/kWh)	460	
External Combined-Cycle Units (FLHR < 9,000 BTU/kWh)	33,769	
Coal Units	8,450	
Total dispatchable generation	**95,810**	**100%**

STUDY RESULTS

RESULTS – CASE A

Case A: 2020 Northern California adverse peak weather (90/10)

- How much additional transmission is needed during a northern CA 1 in 10 peak to achieve 33% goals assuming high imports from the PNW

Case A-SN: 2020 Northern California peak (50/50)

- How much additional transmission is needed during a northern CA 1 in 2 peak to achieve 33% goals assuming high south to north flows

Case A: North to South Flow Summary

		Heavy N-S Flows		
Path Name:	**Rating (MW)**	**A0/A1**	**A2**	**A2-I**
COI	**4800 (N-S)**	4800	4028	**4800**
PDCI	**3100 (N-S)**	3100	3100	3100
	2000 (S-N)			
EOR	**9300 (E-W)**	5845	3308	4533
WOR	**10623 (E-W)**	7837	6249	7763
P-26	**4000 (N-S)**	3700	1648	**3700**
	3000 (S-N)	-	-	-
P-15	**3265 (N-S)**	860	-	-
	5400 (S-N)	-	2054	110

Case A: North to South Results

- No major adverse impacts to COI/P15/P26 paths
- No major reliability issue was found north of Vincent (stability and reactive margins)
- Most of the transmission constraints are south of Vincent

Case A: South to North Flow Summary

		Heavy S-N Flows		
Path Name:	**Rating (MW)**	**A0-SN/A1-SN**	**A2SN**	**A2SN-TEWA**
COI	**4800 (N-S)**	1000	345	345
PDCI	**3100 (N-S)**	-	-	-
	2000 (S-N)	600	600	600
EOR	**9300 (E-W)**	4750	3411	3423
WOR	**10623 (E-W)**	4880	3810	3815
P-26	**4000 (N-S)**	-	-	-
	3000 (S-N)	2458	**4350**	**4370**
P-15	**3265 (N-S)**	-	-	-
	5400 (S-N)	**5400**	**8480**	**8500**

Case A: South to North Results

- During the heavy south-to-north flow conditions, some transmission upgrades may be needed for the P-15 & P-26:
  - Midway – Gregg 500 kV line with 50% series compensation
  - Gregg-Bay Area-Sacramento: Two 500 kV lines north of Gregg to the Bay Area via Warnerville with 50% series compensation.
  - Re-conductor Los Banos – Westley 230 kV line and station equipment.
  - Path 26 S-N upgrade to support heavy S-N flow
  - Tesla – Warnerville 500 kV line & re-conductor the Warnerville-Cottle B-Bellota 230 kV lines

RESULTS – CASE B

Case B: 2020 Southern California adverse peak weather (90/10)

- How much additional transmission is needed during a southern CA 1 in 10 peak to achieve 33% goals without predetermining import flows

Inter-tie & Intra-tie Flow

Path Name	Current Rating (MW)	B0 Case (MW)	B1 Case (MW)	B2 Case (MW)	Diff B2-B0 (MW)
COI	4800	3775	3783	3292	(483)
Path 15	3265 (N-S) 5400 (S-N)	495 (S-N)	491(S-N)	4372 (S-N)	3877
Path 26	4000 (N-S) 3000 (S-N)	1959 (N-S)	1968 (N-S)	1171 (S-N)	3130
EOR	9300	5078	5070	3436	(1642)
WOR	10623	6217	6211	5297	(920)
PDCI	3100	2996	2996	2996	0
IPP DC	2400	1789	1789	1789	0

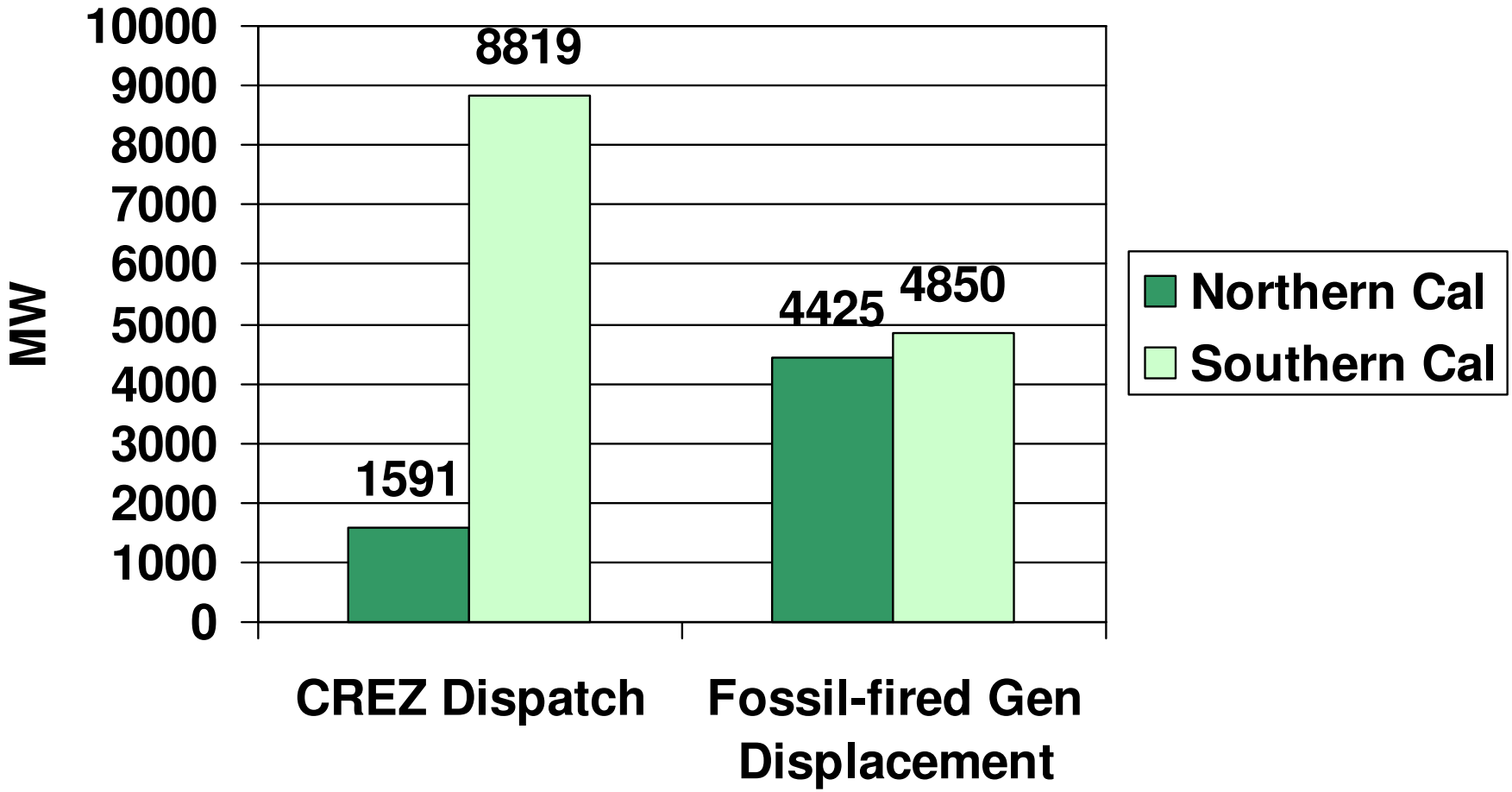
Case B: Study Results

- General Observations:
  - Dynamic stability results showed no violations
  - Post-transient and thermal analyses revealed some constraints. These constraints include:
    - "Local" overloads which occurred at local load serving centers
    - "System" overloads which occurred along the interconnection lines and the parallel underline systems of the major intra-tie paths

Case B: Study Results – Contingency conditions

- The overloaded Imperial Valley – El Centro in the B2 Case could potentially be mitigated by implementing a Special Protection Scheme
- The loss of the newly added Control – Inyokern 230 kV Line in B2 case would result in voltage collapse. This could be avoided by the addition of the second Control-Inyokern 230 kV Line

CREZ Dispatch vs. Fossil-Fired Gen Displacement



Case B: Study Results – Contingency conditions

Double Outages	Impacted Elements	% Overload	Area
B2 Case without Green Path North Project (GPNP)			
Devers – Valley SC 500 kV Lines 1 & 2	Devers – ElCasco 230 kV Devers – SanBerdno 230 kV JHindMWD – JHindSCE 230kV	115% 111% 130%	SCE SCE SCE

Case B - Conclusions

- Transmission enhancements would be required in the following CREZ: Tehachapi, Kramer, Pisgah, and Central Nevada/Inyokern
- Projected renewable resource additions are concentrated in southern California. At the same time a significant portion of the fossil-fired generation that will be displaced by renewable generation is located in northern California.
- Under heavy summer conditions,
  - A change in the historical direction of flows on Path 26 exacerbates the Path 15 flows.
  - With this change in flow patterns, there are N-2 contingency overloads which could be mitigated by generation dropping and/or load dropping or with transmission reinforcements.
- Local overloads in the load centers would have to be mitigated by local transmission reinforcements or by new operating procedures.
- In the absence of the GPNP, additional reinforcements would be required along the Devers-Mira Loma 230 kV lines.

Case B- Conceptual New Transmission Enhancements

- New Barren Ridge – Vincent 500 kV line or Barren Ridge – Whirlwind 500 kV line
- New Kramer – Lugo 500kV Line
- Existing Eldorado – Lugo 500kV looping in at the new Pisgah 500kV Substation
- New Pisgah – Barstow 500 kV line
- New Barstow - Kramer 500 kV Line
- Additional Control-Inyokern 230kV Line
- Reconductoring Westley – Los Banos 230kV

RESULTS – CASE C

Case C: 2020 (50/50) expected peak weather

- Designed to evaluate capability of existing and planned grid

Case C2 Results

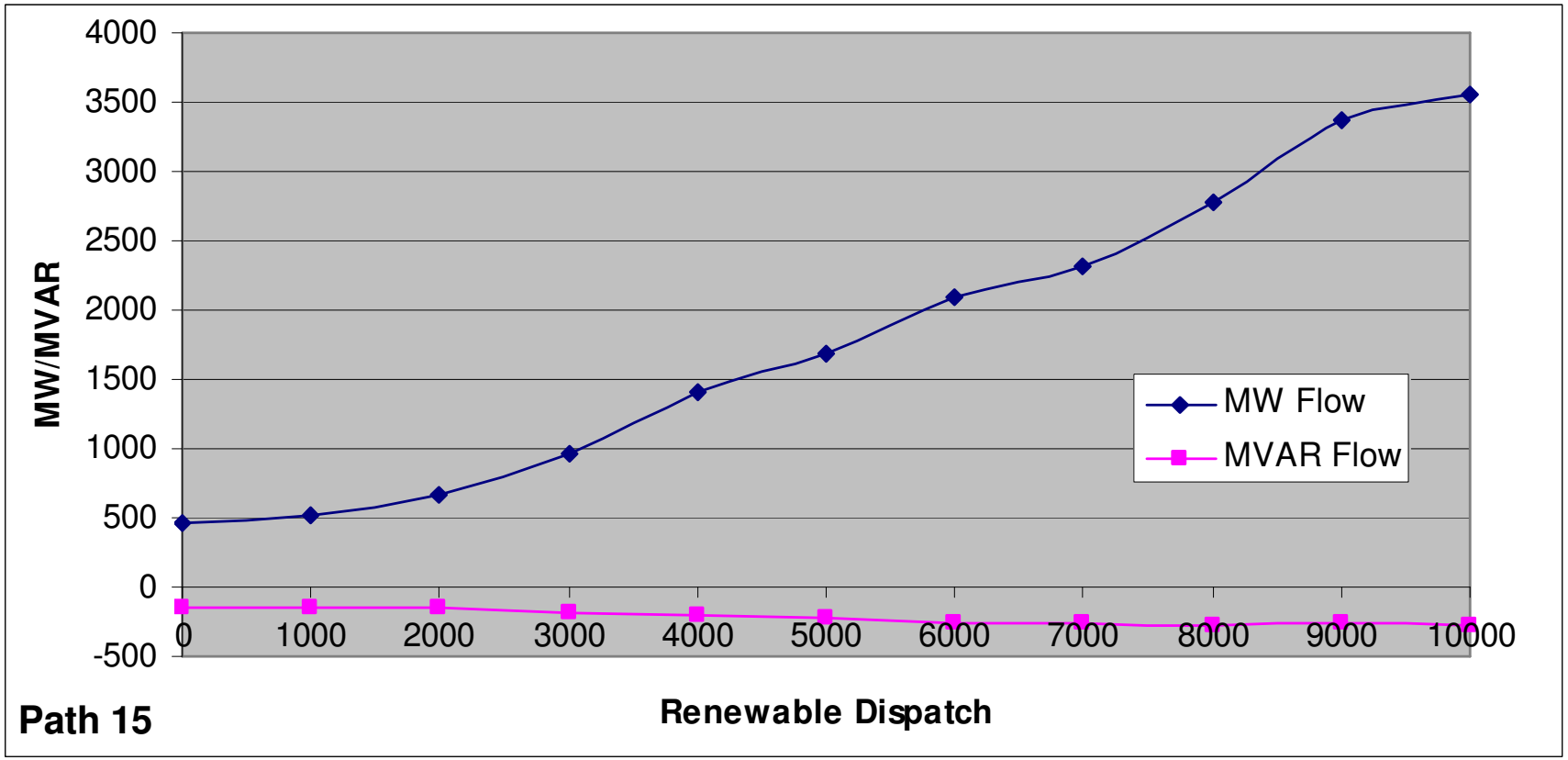
33% Renewable Target		**95,600 GWh**
RETI 2008 Existing Renewable Energy	32,532 GWh	
RETI 2009 Renewable Energy Under Construction	6,792 GWh	
RETI Misc. Other Renewables	2,670 GWh	
Post-2009 Renewable Resource Additions	51,224 GWh	
Total Renewable Energy in 2020		**93,218 GWh**
Percentage of Target Achieved		**97.5%**
Total Retail Sales in 2020	289,698 GWh	
Percentage of Retail Sales Served by Renewable Generation		**32.2%**

Case C Results

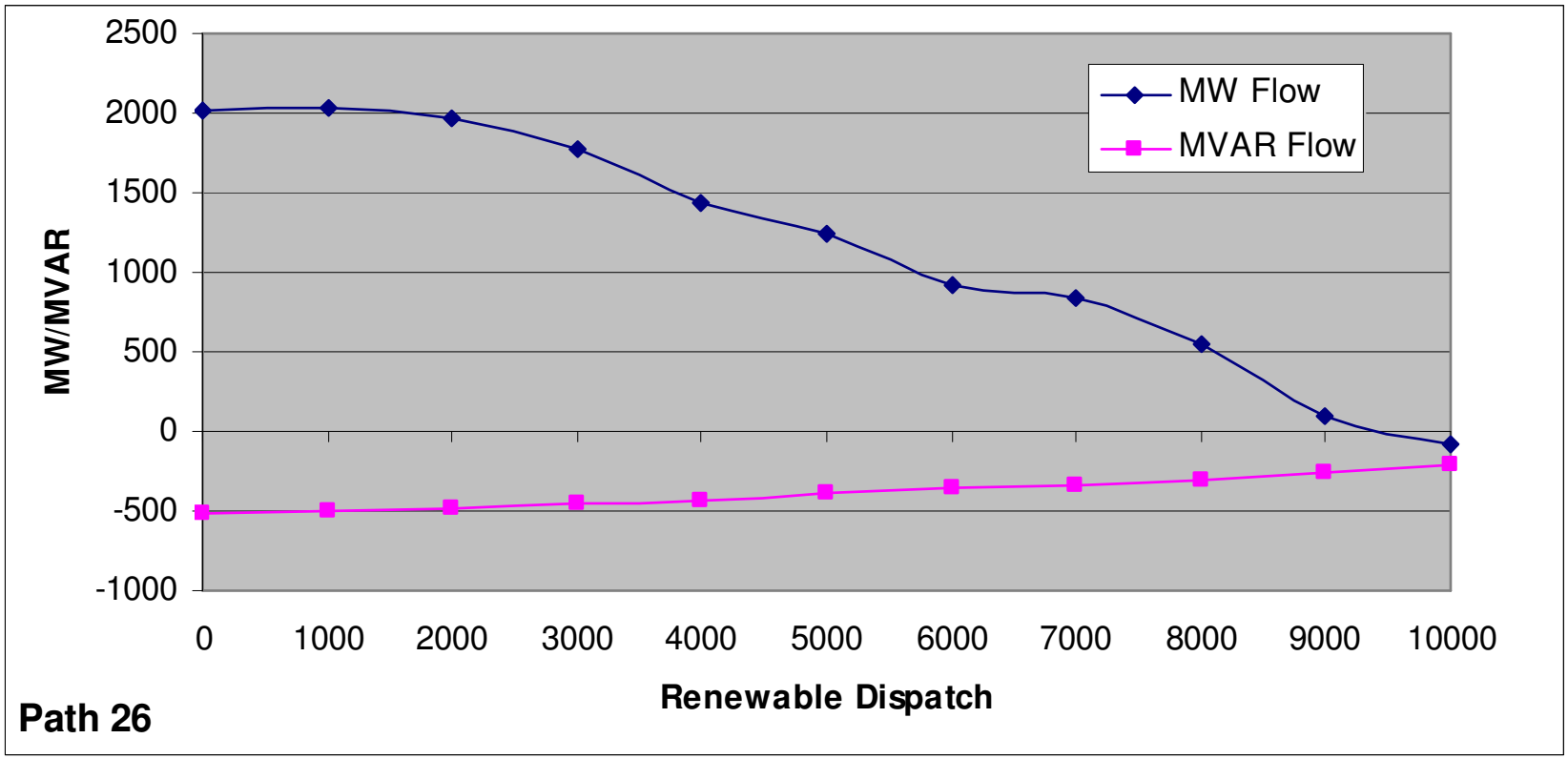
- Maximum planned renewable output at peak: 11,400 MW (Equivalent to 20,600 MW of installed capacity)
- Achieved renewable dispatch at peak: 10,400 MW (Equivalent to 19,200 MW of installed capacity)

- Four constrained renewable regions:
  - Northern Imperial Valley Geothermal
  - Pisgah Solar Thermal
  - Devers Wind
  - East Riverside Solar

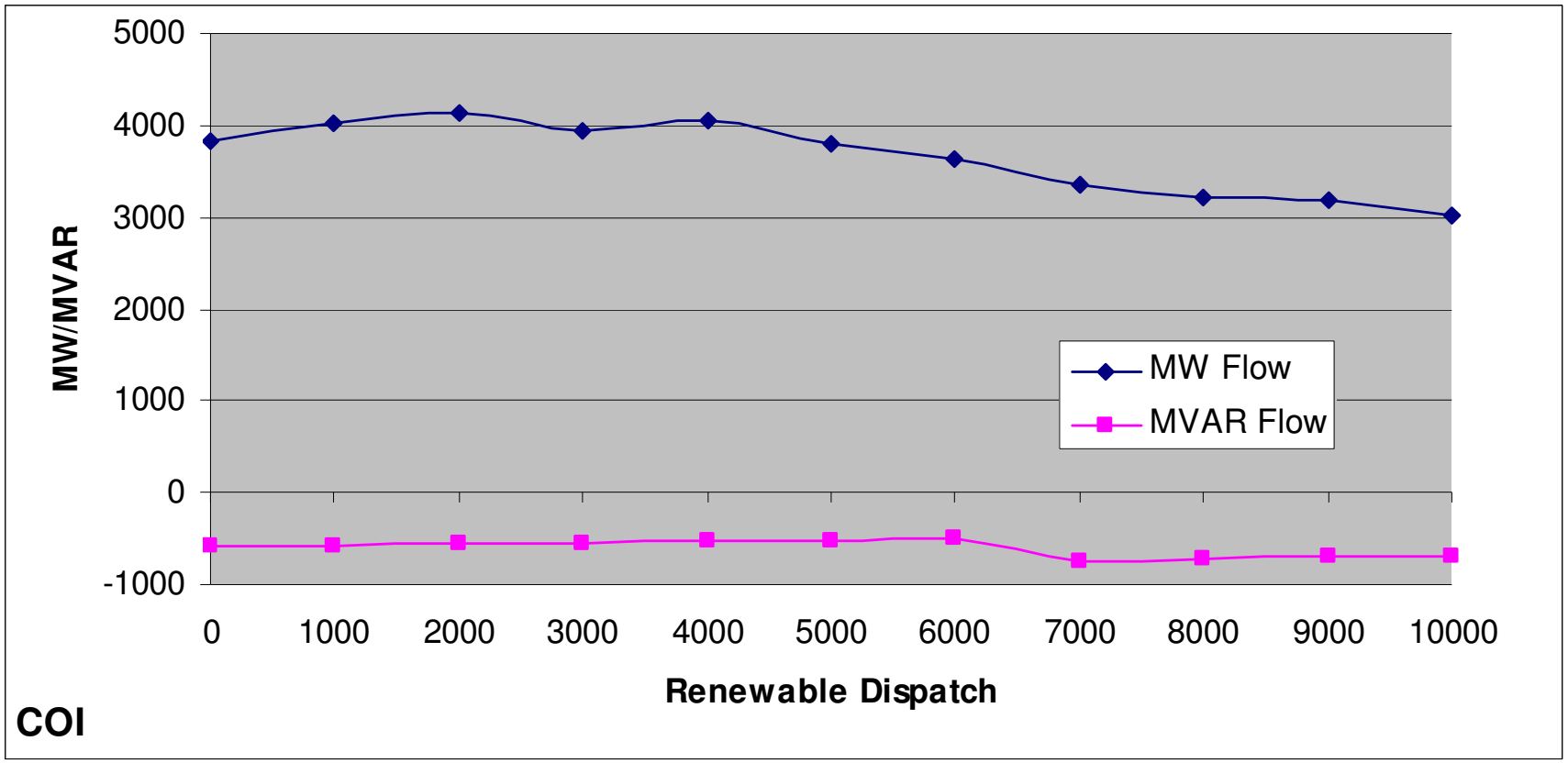
Case C: Path 15 Interface Flows (South to North)



Path 26 Interface Flows (North to South)



Case C: COI Interface Flows



RESULTS – CASE L

Case L: 2020 Light Load

- Assess the California's transmission needs under light loads conditions

Case L – Load Summary

Area	LOAD (MW)
	Off-Peak[1]
SDG&E	2,776
LADWP[2]	3,263
IID	608
SCE[3]	10,302
PG&E[3]	11,613
SMUD	1,293
TID	252
Total	**30,107**

[1] Off-Peak Load represents a Light Spring condition developed from 65% of the Heavy Winter WECC 2019 Case

[2] LADWP includes Burbank and Glendale

[3] SCE and PG&E includes other Munis

Case L – Flow Summary

Path	Current Rating	L0 Case (MW)	L1 Case (MW)	L2 Case (MW)
COI	4800	875	843	2
15	3265 (N-S) 5400 (S-N)	1537 (N-S)	1594 (N-S)	5505 (S-N)
26	4000 (N-S) 3000 (S-N)	631 (N-S)	594 (N-S)	3112 (S-N)
EOR	9300	4129	4186	2741
WOR	10623	5750	5792	3451
PDCI	3100	1000	1000	1000
IPP	2400	1949	1948	1950

Case L - Results

- Overloads observed in L0, L1 and L2
  - No N-1 contingency overloads observed
  - Results showed Base Case overloads in Northwest
  - Overloads were identified in Path 15 area

Case L – Preliminary findings

- Midway – Gregg 500 kV line
- Re-conductor Los Banos – Westley 230 kV line and station equipment.
- Path 26 S-N upgrade to support heavy S-N flow

PHASE 1 SUMMARY

Study Summary

- Study limitations:
  - The study results summarized here are based on the limited scenarios considered in the initial studies conducted by the CTPG study team.
  - Most of the scenarios analyzed do not consider the full output of all renewable generation. Deliverability studies are a subject for future consideration by CTPG

Phase 1 Study Summary (cont.)

- California can make substantial progress towards its renewable resource goals with grid configuration changes to enable CREZ network connections, provided that:
  - Reliability criteria violations can be mitigated through controlled load drop and/or through generation-tripping schemes
- Significant upgrades will be required to both Path 26 and Path 15 to accommodate the expected high north-bound flows (near 4500 MW and 8500 MW, respectively).

Phase 1 Study Summary (cont.)

- Additional transmission or mitigation measures are needed to address reliability criteria violations associated with increased renewable generation in the following CREZ locations:
  - Tehachapi area assuming significant amounts of generation in this area are connected to the Barren Ridge substation,
  - Kramer
  - Pisgah
  - Central Nevada/Inyokern
  - East Riverside County
- Under heavy summer conditions,
  - A change in the historical direction of flows on Path 26 exacerbates the Path 15 flows.
  - With this change in flow patterns, there are N-2 contingency overloads which could be mitigated by generation dropping and/or load dropping or with transmission reinforcements.

Phase 1 Study Summary (cont.)

- Further studies are needed to assess alternatives that could be useful in reliably and efficiently meeting the 33% RPS goal. These include:
  - Voltage Support
  - Controlled load drop for certain contingency conditions
  - Implementation of generation Special Protection Schemes (SPS) and/or related operating procedures

Conceptual New Transmission Summary

- Midway – Gregg 500 kV line
- Gregg-Bay Area-Sacramento: Two 500 kV lines north of Gregg to the Bay Area via Warnerville with 50% series compensation.
- Re-conductor Los Banos – Westley 230 kV line and station equipment.
- New Barren Ridge – Vincent 500kV or Barren Ridge – Whirlwind 500kV Line.
- New Midway – Kramer 500 kV line
- New Kramer – Lugo 500kV Line
- Existing Eldorado – Lugo 500kV line looping in at the new Pisgah 500kV Substation
- New Pisgah-Barstow-Kramer, new Pisgah – Barstow, or new Pisgah – Kramer 500 kV Line
- New Devers-Mira Loma 500 kV Line
- In the absence of the Green Path North Project (GPNP), additional reinforcements would be required along the Devers-Mira Loma 230 kV lines.
- Additional Control-Inyokern 230kV Line
- Completion of a 230 kV double-circuit loop in the IID control area (Highline-El Centro-Imperial Valley)

Report Recommended Next Steps

- Input from stakeholders: Develop cases and scenarios as may be requested by stakeholders and determined to be potential helpful in improving the efficacy of CTPG's conceptual transmission plan.
- Test a range of renewable net-short estimates: A reasonable range of renewable net short estimates may be defined by RETI.
- Generation Redispatch Alternatives: Test other fossil-fired generation dispatch patterns that would accommodate the increase in renewable generation.
- Procurement Scenarios: Test other renewable resource development scenarios (location, type and quantity of renewable resource additions). For instance: out of state scenarios and Owens Lake development.
- Once-through Cooling (OTC) Study: Continue the OTC studies and update the CTPG's conceptual transmission plan as appropriate.
- Deliverability: Develop cases to test the deliverability of renewable resources considering that renewable resources at given locations and at given points in time, may be dispatched at or near peak capacity.

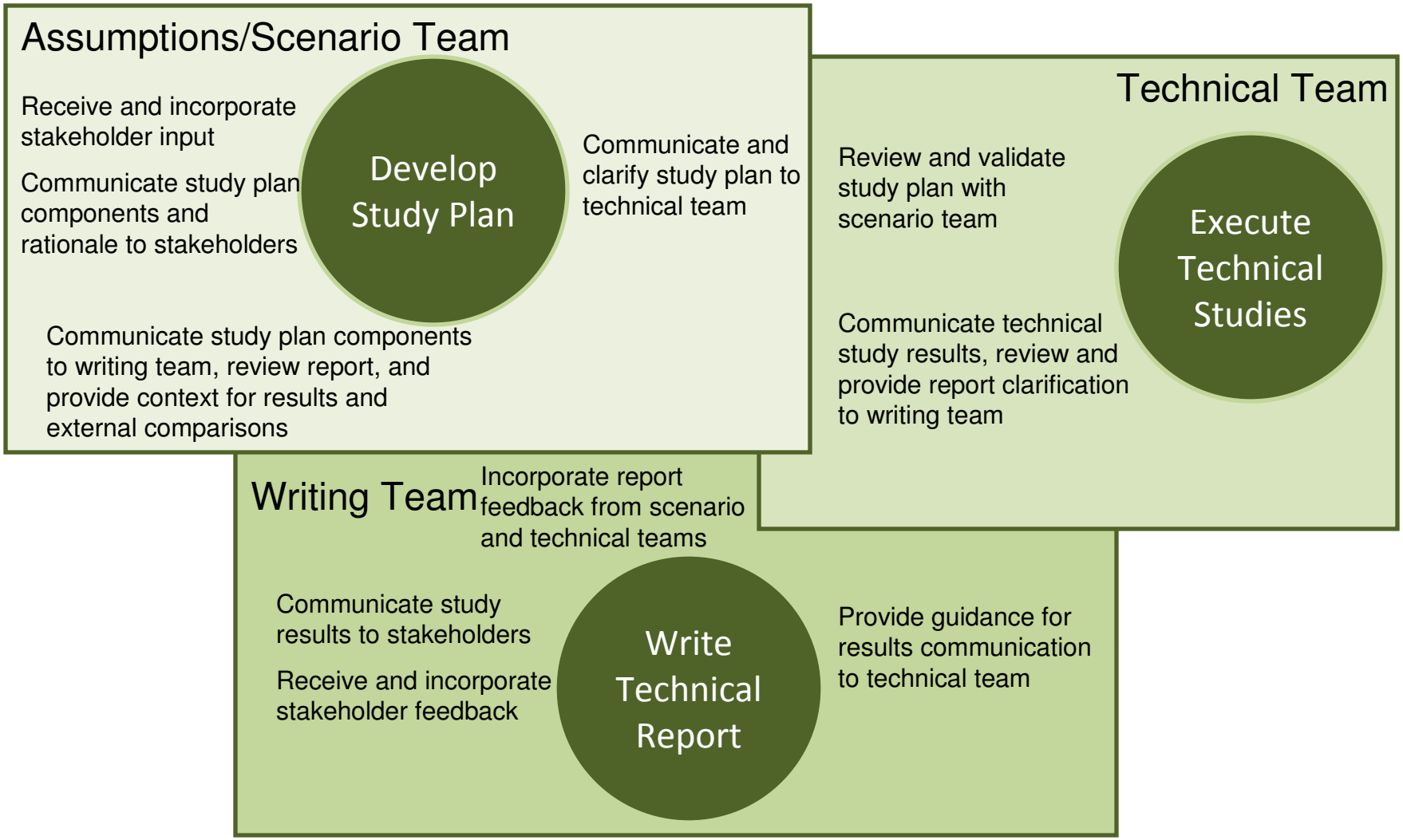
Part 2: Stakeholder Input

NEXT PHASE APPROACH AND DRAFT SCHEDULE

Overview

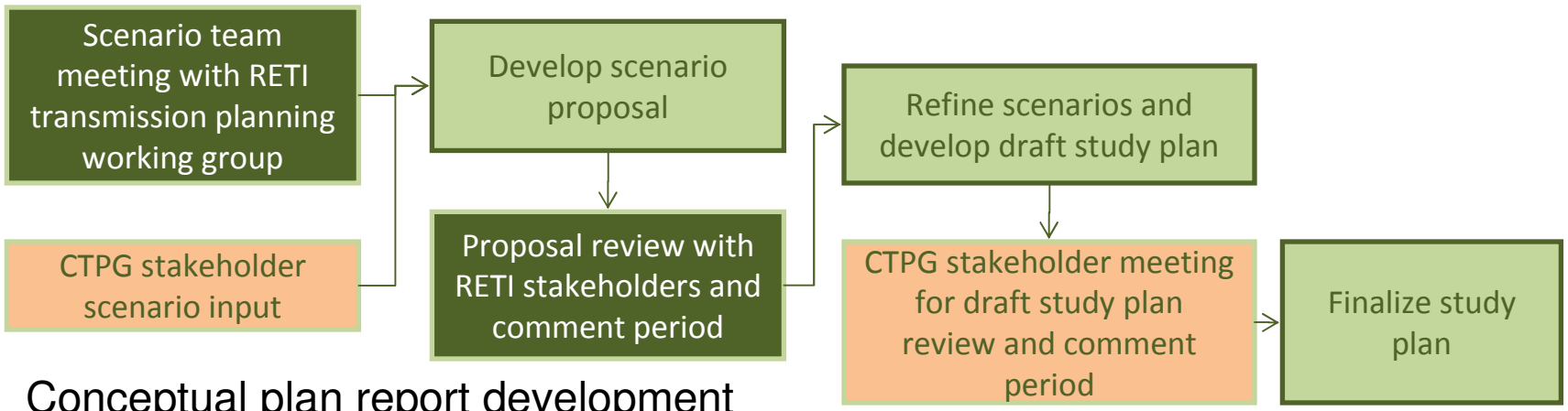
- Incorporate robust stakeholder process to provide input prior to study execution
- Study process enabled by three focused teams
- Efficient study process execution through over-lapping project phases
- Need to balance desire for progress against adequacy of stakeholder involvement and technical completeness

Teams

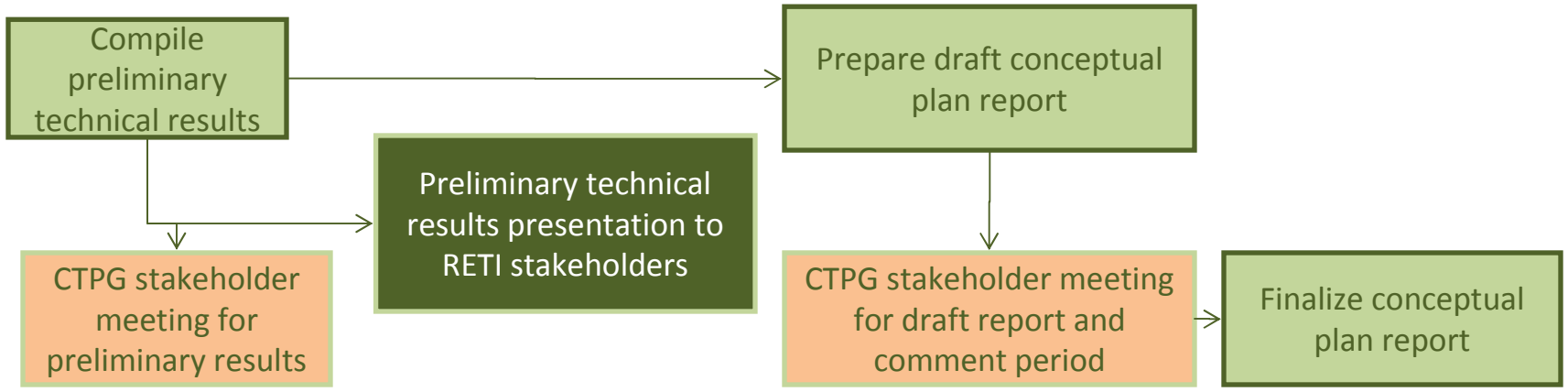

Assumptions/Scenario Team
Receive and incorporate stakeholder input
Communicate study plan components and rationale to stakeholders
Develop Study Plan
Communicate and clarify study plan to technical team
Communicate study plan components to writing team, review report, and provide context for results and external comparisons
Technical Team
Review and validate study plan with scenario team
Execute Technical Studies
Communicate technical study results, review and provide report clarification to writing team
Writing Team
Incorporate report feedback from scenario and technical teams
Communicate study results to stakeholders
Receive and incorporate stakeholder feedback
Write Technical Report
Provide guidance for results communication to technical team

Process Overview

Study plan development



Conceptual plan report development



Preliminary Project Schedule

DRAFT

2010 Study Plan	Dec 7	14	21	28	Jan 4	11	18	25	Feb 1	8	15	22	Mar 1	8	15	22	29	Apr 5	12	19	26	May 3	10	17	24	31	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Initial Study - Phase 1																																	
Write Report					5				15																								
CTPG Stakeholder Meetings			17				20																										
Stakeholder Comments																																	
Revised Study - Phase 2																																	
Develop Study Plan								23	9																								
Run Technical Studies																																	
Write Report															11		30																
RETI Transmission Work Group*						14				8																							
RETI Stakeholder Meetings*							19																										
CTPG Stakeholder Meetings							20		1						18																		
Stakeholder Comments																																	
Final Conceptual Study - Phase 3																																	
Develop Study Plan														9			30																
Run Technical Studies																																	
Write Report																						5				25							
RETI Transmission Work Group*										8				11																			
RETI Stakeholder Meetings*												25																					
CTPG Stakeholder Meetings											16		2		18					20			13										
Stakeholder Comments																																	
Validate/Refine Conceptual Plan**																																	
Kick-off 2011 Plan																																	
CTPG Executive Committee Meetings	3				7				4				4					1				6					3	1	5	2	7	4	2

Yellow = Draft
Red = Final
Blue = In person

*RETI dates to be confirmed

**Includes continued stakeholder process

Draft Conceptual Plan

Final Conceptual Plan

"No Regrets" Project Set

NEXT STUDY ITERATIONS - STAKEHOLDER INPUT

STUDY SCENARIOS DISCUSSION

Report Recommended Next Steps

- Input from stakeholders
- Test a range of renewable net-short estimates
- Generation Redispatch Alternatives
- Procurement Scenarios
- Once-through Cooling (OTC) Study
- Deliverability

MEETING WRAP-UP

Additional slides

Case A: North to South Results

- No major adverse impacts to COI/P15/P26 paths
- No major reliability issue was found north of Vincent (stability and reactive margins)
- Most of the transmission congestions are south of Vincent (recommended transmission upgrades will be addressed in Case C

Contingency:								Base case: A2 - I				Base case: A2			
	FROM BUS	KV	TO BUS	KV	ID	Unit	AR	AMPS	MVA	RATING	PCT	AMPS	MVA	RATED	PCT
IV-N.Gila_CREZ	BARRE	230	ELLIS	230	#1	Amps	24	2945	1087	2480	118.76%	3236	1236	2480	130.46%
IV-Miguel 23050 SLO	BARRE	230	ELLIS	230	#1	Amps	24	2825	1043	2480	113.90%	3154	1205	2480	127.16%
IV-Miguel 23040 SLO	BARRE	230	ELLIS	230	#1	Amps	24	2835	1047	2480	114.32%	3141	1200	2480	126.64%
Elverta_bkr1182_sb	HURLEY S	230	ELVERTAW	230	#2	Amps	30	1230	483	1080	114.00%	1218	476	1080	112.87%
Devers - Valey DLO	SANBRDNO	230	DEVERS	230	#1	Amps	24	912	354	796	114.79%	No thermal overload			
	DEVERS	230	EL CASCO	230	#1	Amps	24	1225	492	1150	106.68%	No thermal overload			
Table Mt. South DLO	TABLE MT	500	TB MT 1M	500	#1	MVA	30	1277	1175	1122	104.69%	1227	1132	1122	100.85%
	TB MT 1M	500	TBL MTX1	230	#1	MVA	30	1340	1151	1122	102.66%	1696	675	1700	100.07%
SONG 1G	BARRE	230	ELLIS	230	#1	Amps	24	2662	986	2480	107.33%	2962	1140	2480	119.42%
RM-TM #1 SLO	ROUND MT	500	TABLE MT	500	#2	Amps	30	3336	3071	3281	101.70%	No thermal overload			
Palo Verde - W.Wing DLO	BRANDOW	230	KYRENE	230	#1	Amps	14	1754	705	1600	109.59%	1704	686	1600	106.50%
Lugo South DLO	MIRALOMA	500	PISGAH	500	#1	Amps	24	3019	2643	2565	117.72%	2779	2489	2565	108.36%
Lugo -MiraRvst DLO	MIRALOMA	500	PISGAH	500	#1	Amps	24	2922	2541	2565	113.95%	2654	2367	2565	103.49%
Lugo - Miraloma DLO	MIRALOMA	500	PISGAH	500	#1	Amps	24	3016	2643	2565	117.59%	2776	2489	2565	108.26%
SONG - Santiago DLO	BARRE	230	ELLIS	230	#1	Amps	24	Not Solved				4180	1578	2480	168.59%

RESULTS – CASE A SOUTH NORTH

	Overload equipment								A2SN			A2SN + Tesla - Warn		
Contingency:	**FROM BUS**	**KV**	**TO BUS**	**KV**	**ID**	**Unit**	**AREA**	**RATING**	**AMPS**	**MVA**	**PCT**	**AMPS**	**MVA**	**PCT**
Tracy - Hurley 230 DLO	HURLEY S	230	PROCTER	230	#1	Amps	30	925	1159	463	125.41%	1094	437	118.30%
SONGS-Santiago-DLO	BARRE	230	ELLIS	230	#1	Amps	24	2480	3939	1477	158.85%	3940	1478	158.89%
SONGS 1G	BARRE	230	ELLIS	230	#1	Amps	24	2480	2559	983	103.17%	2558	983	103.16%
PaloVerde - W. Wing DLO	BRANDOW	230	KYRENE	230	#1	Amps	14	1600	1753	709	109.57%	1753	709	109.57%
Obanion - Sutter	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	1699	676	100.32%	No Overload		
	HURLEY S	230	PROCTER	230	#1	Amps	30	925	1103	439	119.37%	983	391	106.30%
PDCI SN Bipole	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	1702	694	100.63%	No Overload		
Mosslanding - Metcalf	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	1886	748	111.29%	1849	736	109.11%
Mosslanding - Los Banos	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	1897	751	112.00%	1859	739	109.74%
Midway - sb	TEMPLETN	230	MORROBAY	230	#1	Amps	30	975	1062	419	108.96%	1053	416	108.04%
Midway - Gregg DLO	PANOCHE	230	MCMULLN1	230	#1	Amps	30	975	1097	435	112.52%	No Overload		
	MCMULLN1	230	KEARNEY	230	#1	Amps	30	975	1044	414	107.12%	No Overload		
	MC CALL	230	HENTAP2	230	#1	Amps	30	975	1008	382	103.86%	No Overload		
	HENTAP1	230	GATES	230	#1	Amps	30	1837	1963	735	106.83%	No Overload		
Metcalf Xformer sb	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	1883	747	111.11%	1846	735	108.95%
Los Banos sb	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	2060	810	121.74%	1987	785	117.42%
	HURLEY S	230	PROCTER	230	#1	Amps	30	925	1016	404	109.97%	No Overload		
Los Banos North DLO	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	2174	882	128.29%	2049	835	120.93%
Los Banos - Midway slo	GATES	500	MIDWAY	500	#1	Amps	30	3556	3569	3101	100.83%	No Overload		
	TEMPLETN	230	MORROBAY	230	#1	Amps	30	975	1015	400	104.12%	1008	398	103.39%
	HURLEY S	230	PROCTER	230	#1	Amps	30	925	963	384	104.23%	No Overload		
Los Banos - Gates #1	HURLEY S	230	PROCTER	230	#1	Amps	30	925	934	373	101.03%	No Overload		
IV-N.Gila	BARRE	230	ELLIS	230	#1	Amps	24	2480	2627	1007	105.93%	2628	1007	105.95%
Gregg - Rancho Seco slo	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	1927	760	113.82%	1925	760	113.66%
Gregg - Midway	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	1732	687	102.33%	1729	688	102.19%
	TEMPLETN	230	MORROBAY	230	#1	Amps	30	975	982	389	100.77%	983	389	100.80%
Gates - Midway slo	TEMPLETN	230	MORROBAY	230	#1	Amps	30	975	1073	423	110.01%	1064	420	109.11%
	HURLEY S	230	PROCTER	230	#1	Amps	30	925	925	370	100.08%	No Overload		
Elverta bkr1182	CARMICAL	230	HURLEY S	230	#1	Amps	30	900	957	384	108.65%	983	395	111.54%
	FOLSOM	230	ROSEVILL	230	#1	Amps	30	801	875	351	109.44%	852	342	106.54%
Obanion -- Elverta	FOLSOM	230	ROSEVILL	230	#1	Amps	30	801	862	346	107.81%	839	337	104.97%
Tracy South DLO	WESTLEY	230	LOSBANOS	230	#1	Amps	30	1700	2187	869	129.16%	2146	855	126.77%
	HURLEY S	230	PROCTER	230	#1	Amps	30	925	981	393	106.18%	No Overload		
Midway North DLO	TEMPLETN	230	MORROBAY	230	#1	Amps	30	975	1024	407	105.00%	1007	401	103.33%
IV - Miguel 23050 slo	BARRE	230	ELLIS	230	#1	Amps	24	2480	2724	1043	109.82%	2724	1043	109.82%
IV - Miguel 23040 slo	BARRE	230	ELLIS	230	#1	Amps	24	2480	2658	1019	107.18%	2658	1019	107.18%

Study Results – Normal Conditions

OVERLOADED COMPONENT	Case B0 % Overload	Case B1 % Overload	Case B2 % Overload	AREA
CHINO 66/230kV xfmr 1	103%	103%	N/A	SCE
CHINO 66/230kV xfmr 2	102%	102%	N/A	SCE
CHINO 66/230kV xfmr 3	101%	101%	N/A	SCE
EAGLROCK 66/230kV xfmr 3	104%	104%	N/A	SCE
EAGLROCK 66/230kV xfmr 4	107%	107%	103%	SCE
JOHANNA 66/230kV xfmr 3	107%	107%	103%	SCE
JOHANNA 66/230kV xfmr 4	108%	108%	104%	SCE
VIEJO66 - VIEJOSC 66/230kV xfmr 1	130%	130%	125%	SCE
VIEJO66 - VIEJOSC 66/230kV xfmr 2	130%	130%	125%	SCE
ARCO 230/70kV xfmr 2	122%	122%	122%	PG&E
ARCO - TWISSLMN 70kV line 1	124%	123%	122%	PG&E
CORCORAN 115/70 xfmr 2	117%	117%	115%	PG&E
GLEAF TP - RIO OSO 115kV Line 1	101%	100%	N/A	PG&E
TWISSLMN - TX LOSHL 70kV Line 1	109%	109%	109%	PG&E
TX LOSHL - NTPTRL 70kV Line 1	110%	109%	109%	PG&E
WEBER 1 - WEBER 2 60kV Line 1	105%	111%	110%	PG&E

Study Results – Normal Conditions

OVERLOADED COMPONENT	Case B0 % Overload	Case B2 % Overload	Case B2 % Overload	AREA
KRAMER – LUGO 230 kV Line 1	102%	103%	N/A	SCE
KRAMER – LUGO 230 kV Line 2	102%	103%	N/A	SCE
BORDEN – GREGG 230 kV Line 1	101%	101%	N/A	PG&E
JHIND MWD – JHIND SCE 230 kV	N/A	N/A	108%	SCE
OXBOW B 230/115 kV Xfmr 1	N/A	N/A	230%	SCE
PALERMO – HONC JT1 115 kV Line 1	N/A	N/A	102%	PG&E
TESLA –AEC TP1 115 kV Line 1	N/A	N/A	112%	PG&E

- Pre-existing overloads in the benchmark B0 and B1 Cases alleviated or disappeared in B2 Case due to:
  - the implementation of photovoltaic programs which were modeled as load reductions
  - Addition of new line such as Kramer – Lugo 500 kV Line
  - Re-dispatching generation scheme utilized
- 4 Overloads were found in B2 cases. These overloads were deemed not critical and can be mitigated by local transmission reinforcements

Case B: Study Results – Contingency conditions

Single Outage	Impacted Element	% Overload	Area
B0, B1 Cases			
Kramer-Lugo 230 kV Line 1	Kramer - Lugo 230 kV Line 2	140%	SCE
Silvergate –South Bay 230kV Line	Sweetwtr - Mongytp 69kV	113%	SDG&E
B2 Case			
North Gila-West Gila 230 kV	Imperial Valley-El Centro 230 kV	119%	IID
West Gila-Imperial Valley 230 kV	Imperial Valley-El Centro 230 kV	118%	IID
Control-Lone Pine-Inyokern 230 kV	Voltage Collapse	-	SCE

- Two overloads in the benchmark cases, B0 and B1, disappeared in B2 Case.
- The overloaded Imperial Valley – El Centro in B2 Case could be mitigated by implementing a Special Protection Scheme
- The loss of the newly added Control – Inyokern 230 kV Line in B2 case would result in voltage collapse. This could be avoided by the addition of the second Control-Inyokern 230 kV Line

Case B: Study Results – Contingency conditions

Double Outages	Impacted Elements	% Overload	Area
B0, B1 Cases			
San Onofre–Talega 230kV Lines 1 & 2	Ocnsdtp - Stuarttp 69kV Japanese Mesa - Talega 69kV Stuarttp - Laspulgs 69kV	110% 108% 105%	SDG&E SDG&E SDG&E
PEN – Escondido 230 kV Lines 1 & 2	Northcty-Penasqtos 69 kV Melrstp – Sanlusry 69 kV	107% 105%	SDG&E SDG&E
Rancho Seco-Bellota 230kV Lines 1 & 2	Weber1 – Weber 2 60 kV Procter - Hedge 230 KV	113% 104%	SMUD SMUD

Case B: Study Results – Contingency conditions

Double Outages	Impacted Elements	% Overload	Area
B2 Case			
Malin–Round Mt 500 kV Lines 1 & 2	Westley – Los Baños 230 kV	101%	PG&E
Round Mt–Table Mt 500 kV Lines 1 & 2	Westley – Los Baños 230 kV	103%	PG&E
Table Mt-Tesla & Table Mt–Vaca Dix 500 kV Lines	Westley – Los Baños 230 kV	108%	PG&E
Table Mt-Tesla & Vaca Dix-Tesla 500 kV Lines	Westley – Los Baños 230 kV	106%	PG&E
Tesla–Los Baños & Tesla-Tracy 500 kV Lines	Westley – Los Baños 230 kV	101%	PG&E
Tesla–Los Baños & Tracy–Los Baños 500 kV Lines	Westley – Los Baños 230 kV	103%	PG&E
San Onofre–Talega 230kV Lines 1 & 2	Ocnsdtp - Stuarttp 69kV Japanese Mesa - Talega 69kV Stuarttp - Laspulgs 69kV	112% 109% 105%	SDG&E SDG&E SDG&E
PEN–Escondido 230 kV Lines 1 & 2	Northcty-Penasqtos 69 kV Melrstp – SanLusRy 69 kV Melrstp – SanMrcos 69 kV Poway – Pomerado 69 kV	108% 109% 106% 101%	SDG&E SDG&E SDG&E SDG&E
Imperial Vly-Eco & Imperial Vly-Centralx 500 kV Lines w/ cross trip IV-ROA or OM-TJI 230 kV	Barre-Ellis 230 kV	166%-159%	SCE

Case L - Results

- Overloads observed in L0, L1 and L2
  - No N-1 contingency overloads observed

Case	Contingency	Impacted Elements	% Overload	Area
L0	Base Case	PANOCHE - MCMULLN1 230 kV	102	PG&E
L1	Base Case	PANOCHE - MCMULLN1 230 kV	104	PG&E
	Base Case	MCMULLN1 - KEARNEY 230 kV	101	PG&E
L2	N-2: Midway - Gates 500 kV and Midway - Los Banos 500 kV	WARNERVL - WILSON 230 kV	109	PG&E
	N-2: Midway - Gates 500 kV and Midway - Los Banos 500 kV	BORDEN - GREGG 230 kV	95	PG&E
	N-2: Los Banos - Gates # 1 and Los Banos - Midway # 2 500 kV	WARNERVL - WILSON 230 kV	113	PG&E
	N-2: Los Banos - Gates # 1 and Los Banos - Midway # 2 500 kV	BORDEN - GREGG 230 kV	94	PG&E
	N-2: Tesla - Los Banos and Tracy - Los Banos 500kV	WESTLEY - LOS BANOS 230 kV	116	PG&E
	N-2: Tesla - Los Banos and Tracy - Los Banos 500kV	WESTLEY - LOS BANOS 230 kV	132	PG&E

  - Results showed Base Case overloads in BPA area, therefore further coordination with BPA is needed.