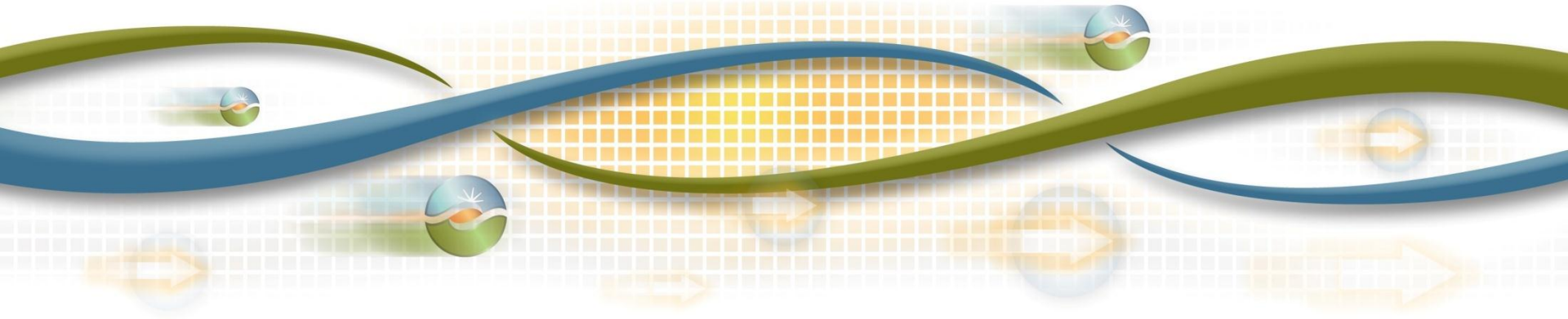


Agenda

Draft 2014-2015 ISO Transmission Plan Stakeholder Meeting

Tom Cuccia
Sr. Stakeholder Engagement and Policy Specialist
February 17, 2015



2014-2015 Draft Transmission Plan Stakeholder Meeting - Today's Agenda

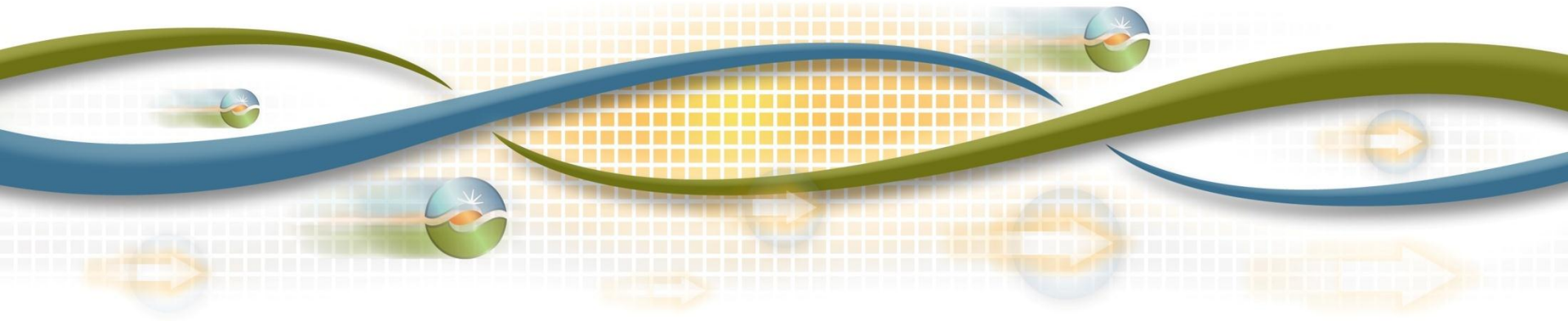
Topic	Presenter
Opening	Tom Cuccia
Introduction & Overview	Neil Millar
Recommended Reliability Projects for Kern area and San Francisco Peninsula area	Chris Mensah-Bonsu and Jeff Billinton
Southern California (LA Basin/San Diego) Long-Term LCR Updates	David Le
Potential Southern California Backup Transmission Alternatives	David Le
Economic Planning Study Final Recommendation	Yi Zhang
Western Planning Regions – Regional Status Reports WestConnect ColumbiaGrid Northern Tier Transmission Group	Charlie Reinhold Paul Didsayabutra Sharon Helms
Wrap-up and Next Steps	Tom Cuccia



Introduction & Overview Transmission Plan Development

Draft 2014-2015 ISO Transmission Plan Stakeholder Meeting

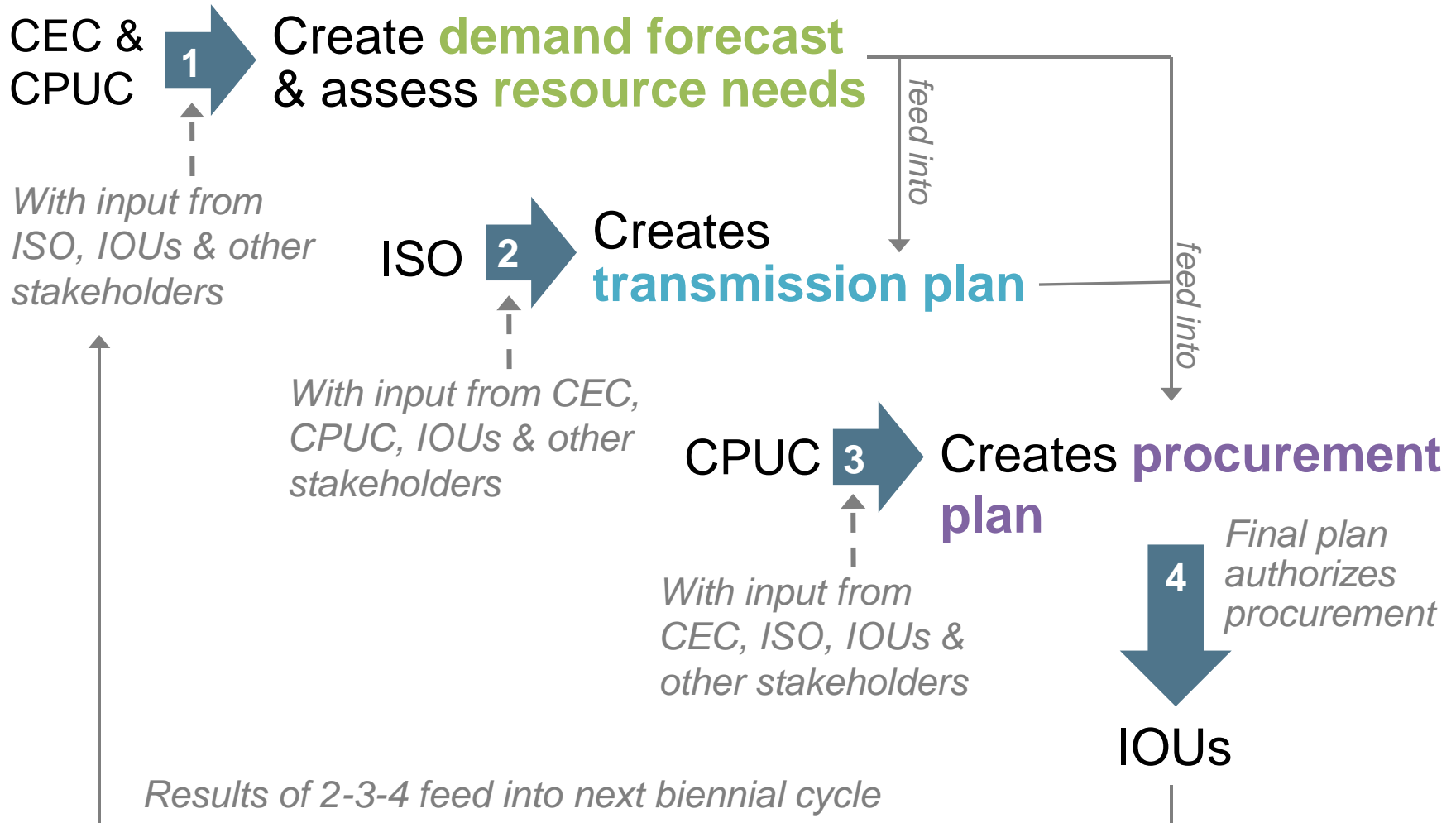
Neil Millar
Executive Director - Infrastructure Development
February 17, 2015



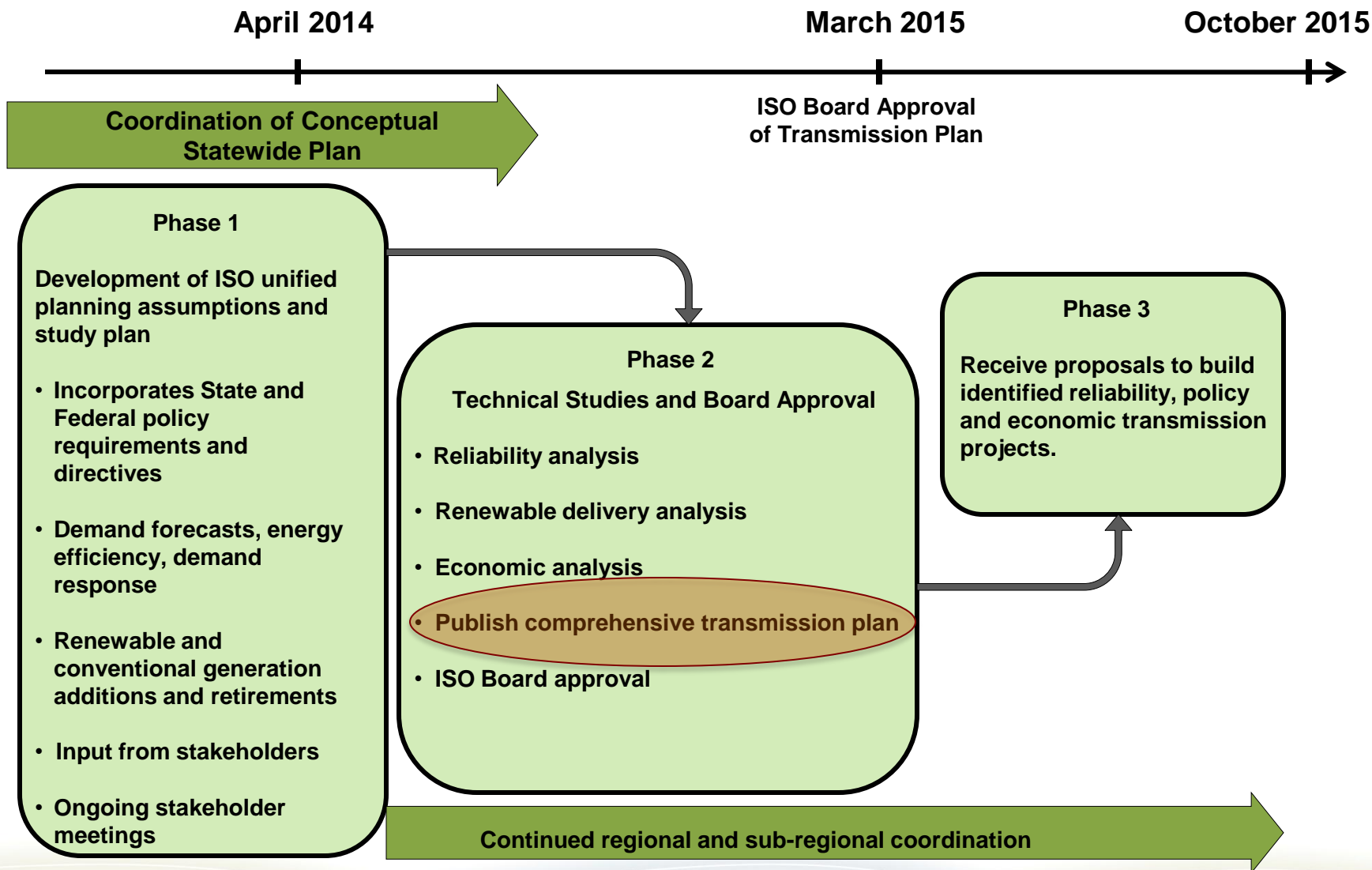
The 2014-2015 planning cycle has been challenging:

- Further enhancements to the coordination with state energy agencies
- Continued emphasis on preferred resources, and increased maturity of study processes
- Continued analysis and contingency planning in the LA Basin and San Diego area
- Restoration of deliverability in Imperial area to pre-SONGS retirement levels
- Sensitivity analysis of Imperial area deliverability and the interaction with LA Basin/San Diego reliability needs.
- San Francisco Peninsula extreme event analysis
- “Over Generation” frequency response assessment
- Finalizing projects in the 2013-2014 cycle requiring further study :
 - Delany-Colorado River
 - Harry Allen –Eldorado (2013-2014 further study)

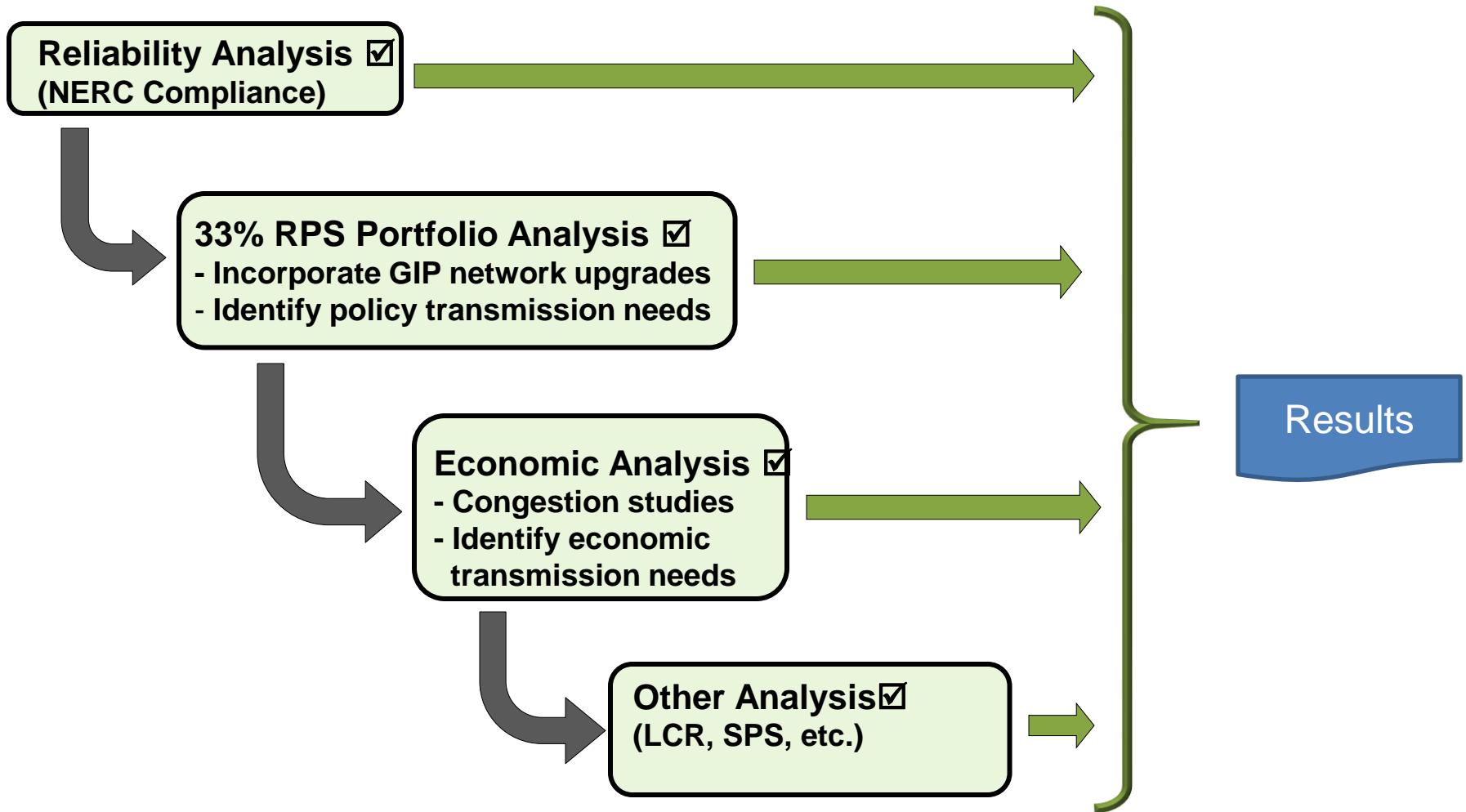
Planning and procurement overview



2014-2015 Transmission Planning Cycle



Development of 2014-2015 Annual Transmission Plan



Summary of Needed Reliability Driven Transmission Projects

Service Territory	Number of Projects	Cost (in millions)
Pacific Gas & Electric (PG&E)	2	\$254
Southern California Edison Co. (SCE)	1	\$5
San Diego Gas & Electric Co. (SDG&E)	4	\$93
Valley Electric Association (VEA)	0	0
Total	7	\$352

Management approval has been received on 5 reliability-driven projects less than \$50 million

- These projects were reviewed individually at the November 19-20 stakeholder meeting, and approval took place after the December 17-18 Board of Governors meeting.
- They will not be reviewed and discussed in today's stakeholder session.
- 2 projects greater than \$50 million will be reviewed as part of today's session.

No.	Project Name
1	2nd Pomerado - Poway 69kV Circuit
2	Mission-Penasquitos 230 kV Circuit
3	Reconductor TL692: Japanese Mesa - Las Pulgas
4	TL632 Granite Loop-In and TL6914 Reconfiguration
5	Laguna Bell Corridor Upgrade

Recommending approval on 2 reliability driven projects more than \$50 million

No.	Project Name	Project Cost
1	North East Kern 70 to 115 kV Voltage Conversion	\$85-125M
2	Martin 230 kV Bus Extension Project	\$85-129M

Policy and Economic driven solutions:

- There were no policy-driven solutions identified
- One economically driven element has been identified:
 - Lodi-Eight Mile 230 kV Line
- Note that the Harry Allen-Eldorado and Delaney-Colorado River Projects were approved during 2014 based on further study in the 2013-2014 planning process

The 2014-2015 Transmission Plan has largely restored deliverability from Imperial to pre-SONGS retirement levels and considerable generation is moving forward:

	2012-2013 Plan		2014-2015 Plan Findings
	IID Import Capability (MIC)	Imperial area New Generation Amount	
Existing IID MIC	462 MW		+200 = 662 MW
Additional <u>targeted</u> future IID MIC for RPS	938 MW	938 MW	
Additional ISO-connected renewables		762 MW	850-1000 MW
Additional available (first come, first served)			500-750 MW
<i>Total</i>	<i>1400 MW</i>	<i>1700 MW</i>	<i>1700 -1800 MW</i>

Other considerations:

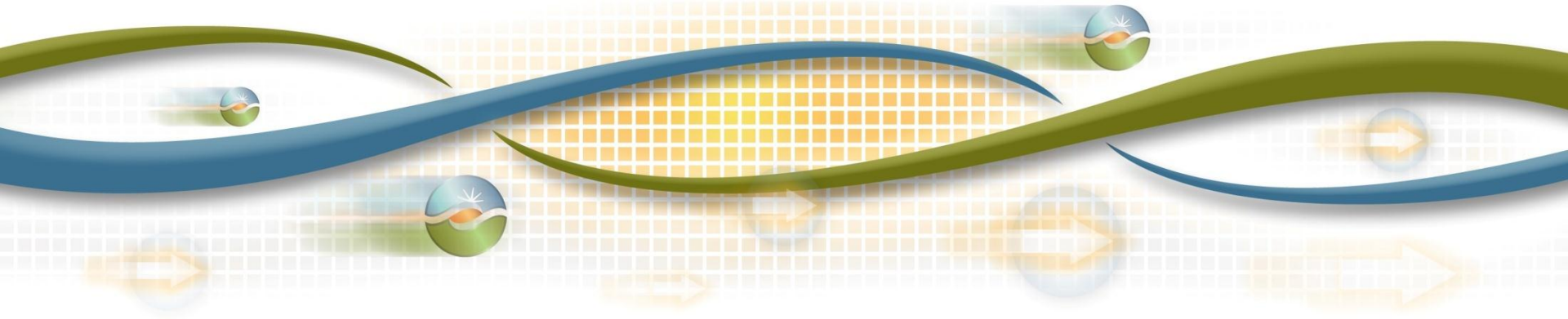
- No regional transmission solutions recommended for approval in this 2014-2015 transmission plan are eligible for competitive solicitation.
- Continued focus on managing CEI access:
 - San Francisco peninsula analysis
 - Detailed reliability discussions
- Transmission Access Charge model to be incorporated into final draft transmission plan



Reliability Projects Recommended for Approval *Kern Area*

2014-2015 Transmission Plan Stakeholder Meeting

Chris Mensah-Bonsu, Ph.D.
Sr. Regional Transmission Engineer
February 17, 2015



One Project Recommended for Approval (over \$50M)

North East Kern Voltage Conversion

Submitted by: PG&E

Need: In **2016**. Mitigate NERC Category B & C thermal overloads.

- Lerdo-Lerdo Jct ; Petrol Jct-Live Oak; & Petrol Jct-Mt. Poso 115 kV #1 Lines following loss of Kern Oil-Witco 115 kV Line & Mt. Poso #1 Unit (G-1/L-1).
- Live Oak-Kern Power 115 kV #1 Line following loss of PSE Live Oak-Kern Oil-Witco 115 kV Line
- Category C: Kern PP #3 230/115 kV Bank overload due to Kern PP #4 & #5 230/115 kV bank outage.

Project Scope:

- Convert the Semitropic-Wasco-Famoso & Kern PP-Kern Oil-Famoso 70 kV Lines to 115 kV Lines.
- Convert Famoso, Kern Oil and Kern PP "E" 115 kV buses to BAAH
- Install SPS as part of the Kern PP 230 kV Area Reinforcement Project to mitigate Kern PP #3 230/115 kV Bank thermal overload for double Kern PP #4 & 5 230/115 kV Bank outage.

Cost: \$85M-\$125M

Other Considered Alternatives

- Status Quo
- New Rio Bravo-7th Standard 115 kV Line. Does not provide adequate capacity to completely remove existing action plans

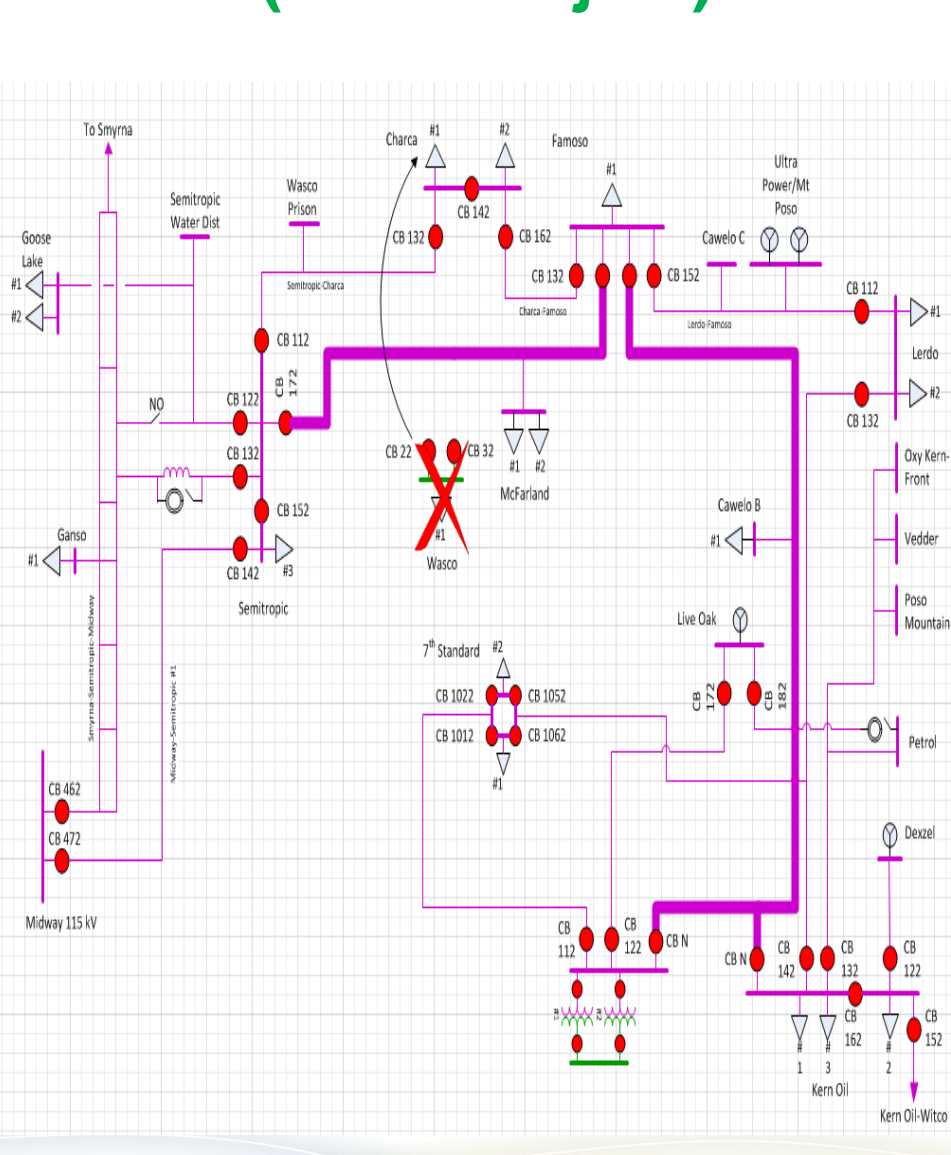
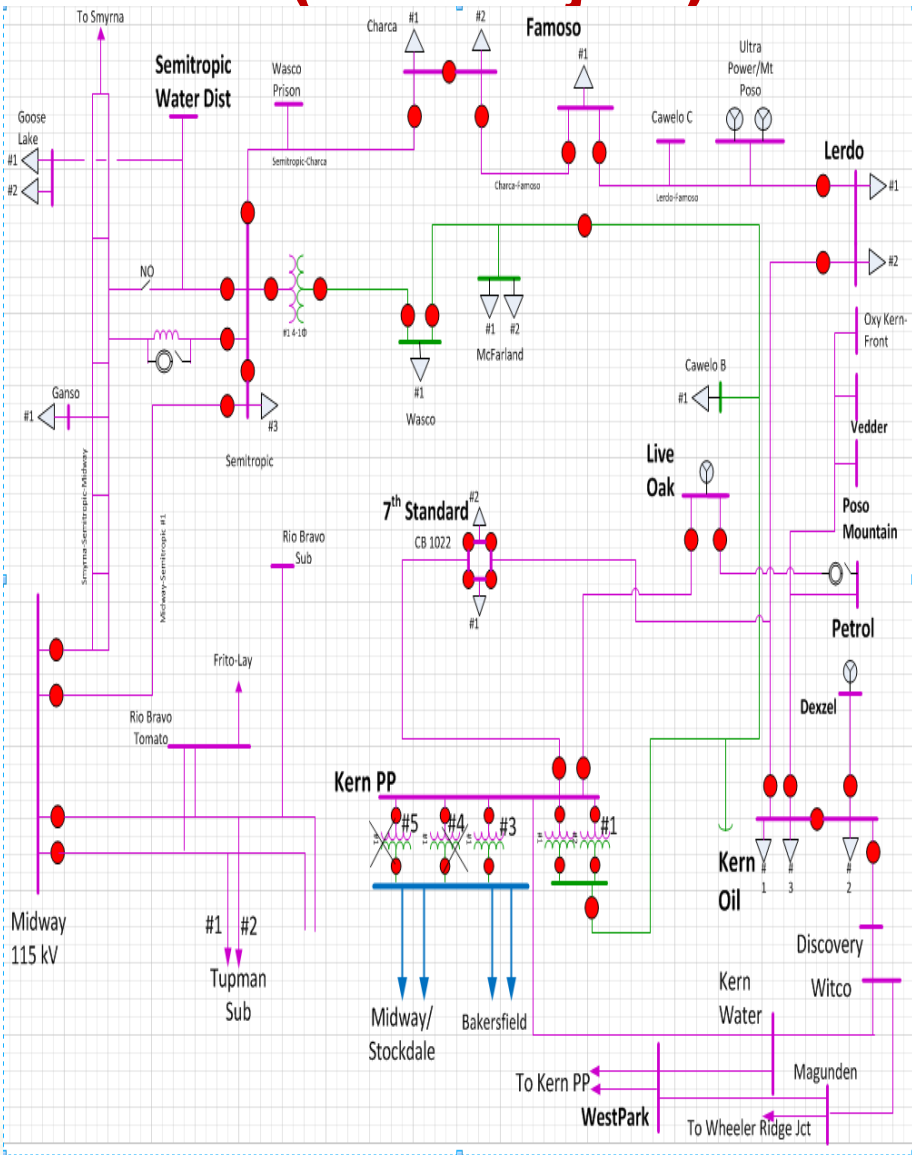
Expected In-Service: May 2022

Interim Plan: Action Plan

Potential Issues: None

Recommended Action: Approval by the CAISO Board

North East Kern Voltage Conversion (Pre-Project) (Post-Project)



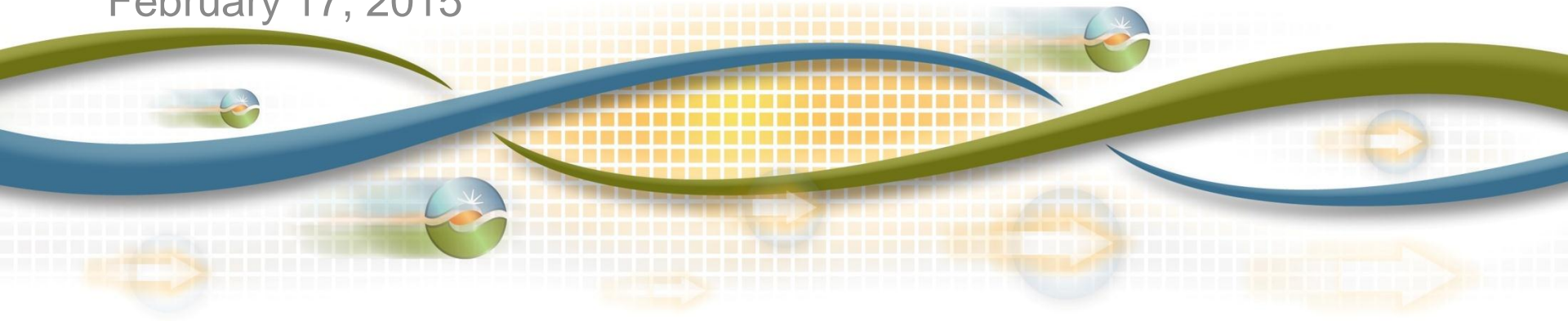


Reliability Project Recommended for Approval *San Francisco Peninsula*

Available on Market Participant Portal
Confidential – Subject to Transmission Planning NDA

Draft 2014-2015 ISO Transmission Plan Stakeholder Meeting

Jeff Billinton
Manager, Regional Transmission - North
February 17, 2015

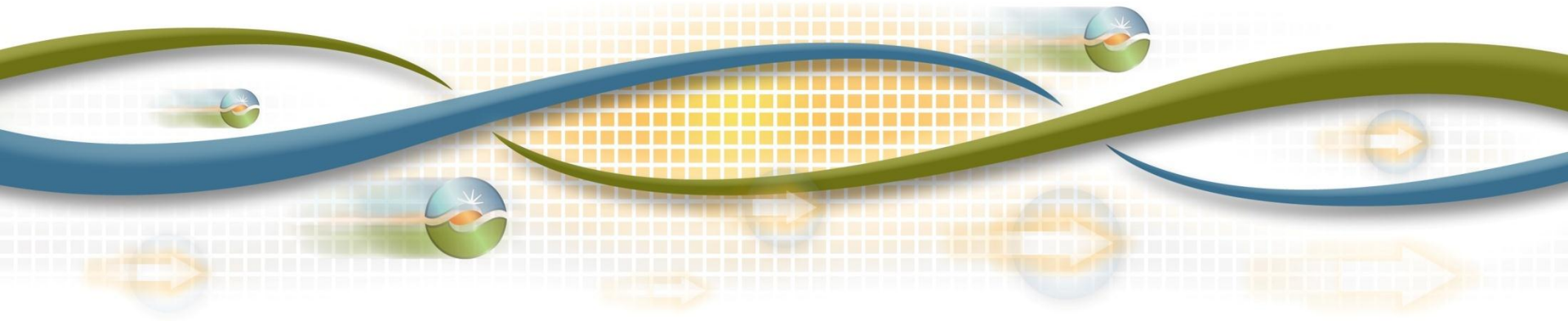




Southern California (LA Basin and San Diego) Long-Term LCR Updates

Draft 2014-2015 ISO Transmission Plan Stakeholder Meeting

David Le
Senior Advisor Regional Transmission Engineer
February 17, 2015

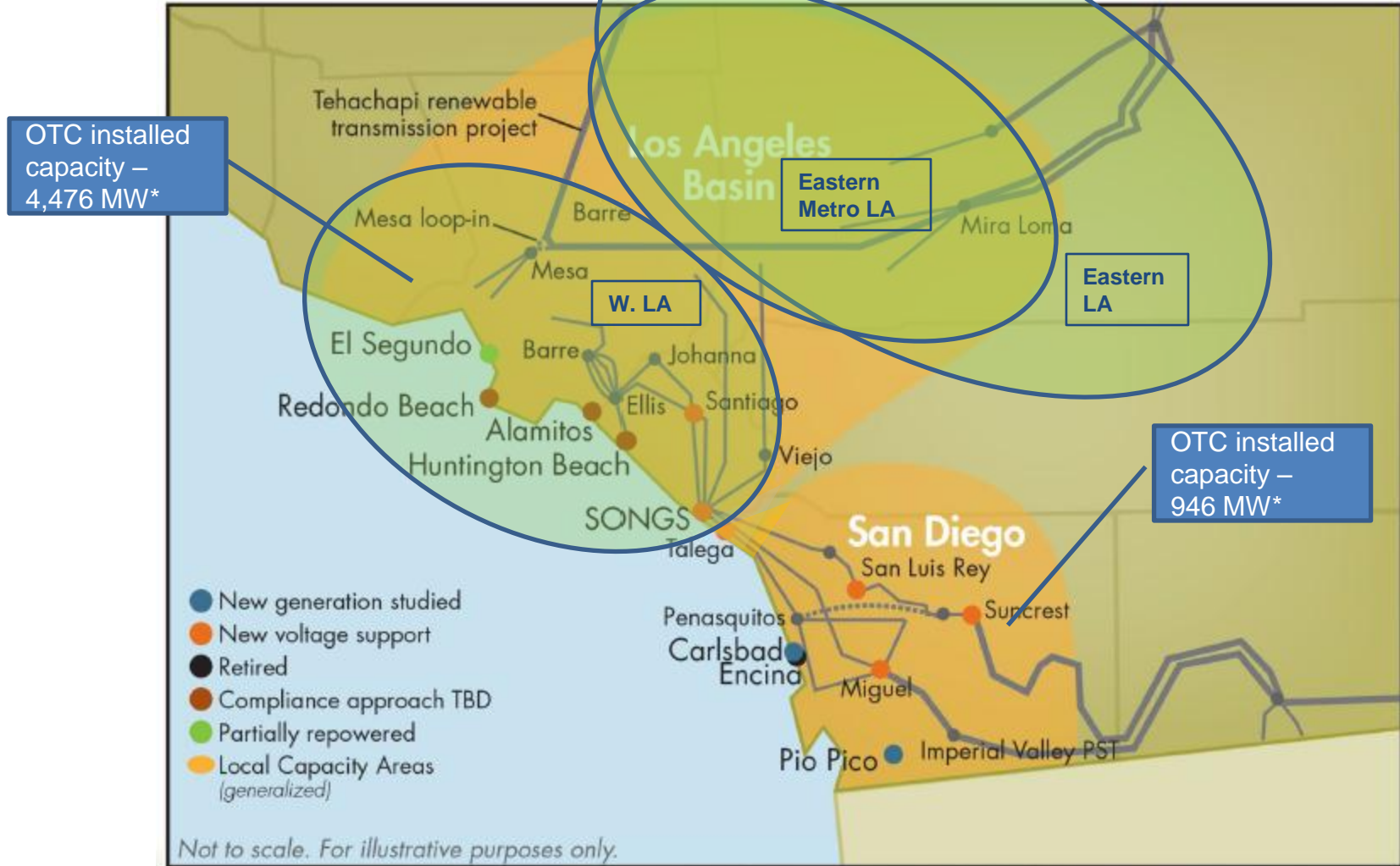


High-level summary assessment of 2024 long-term LCR study results for the combined LA Basin / San Diego Area

No	LTPP Procurement, DR and AEE Scenarios	Results
1	If authorized LTPP Tracks 1 and 4 resources are procured fully (i.e., 2,500 MW for SCE and 1,100 MW for SDG&E) with the use of Track 4 assumptions (i.e., 198 MW)	Then there is no resource deficiency
2	If LTPP Tracks 1 and 4 are not fully procured (i.e., 608 MW less than authorized amount for the Western LA Basin), OR If AEE does not materialize as forecast (i.e., 608 MW less than forecast) (again with the use of Track 4 DR assumptions)	Then there would be resource deficiency,
3	If LTPP Tracks 1 and 4 are not fully procured (i.e., 608 MW less than authorized amount for the LA Basin), OR AEE fails to materialize at forecast levels (i.e., 608 MW less than forecast), <u>but available existing DR (i.e., up to 449 MW in the Western LA Basin) can be successfully “repurposed” with adequate operational characteristics to satisfactorily be implemented for use by the ISO to meet contingency conditions</u>	Then it is anticipated that there would be no resource deficiency

Notes: Both levels of procurement for the LA Basin were studied (i.e., 2,500 MW authorized level, and SCE-selected procurement of 1,892 MW). The lower level of procurement (1,892 MW) was evaluated further in details as the locations for the resource assumptions were provided.

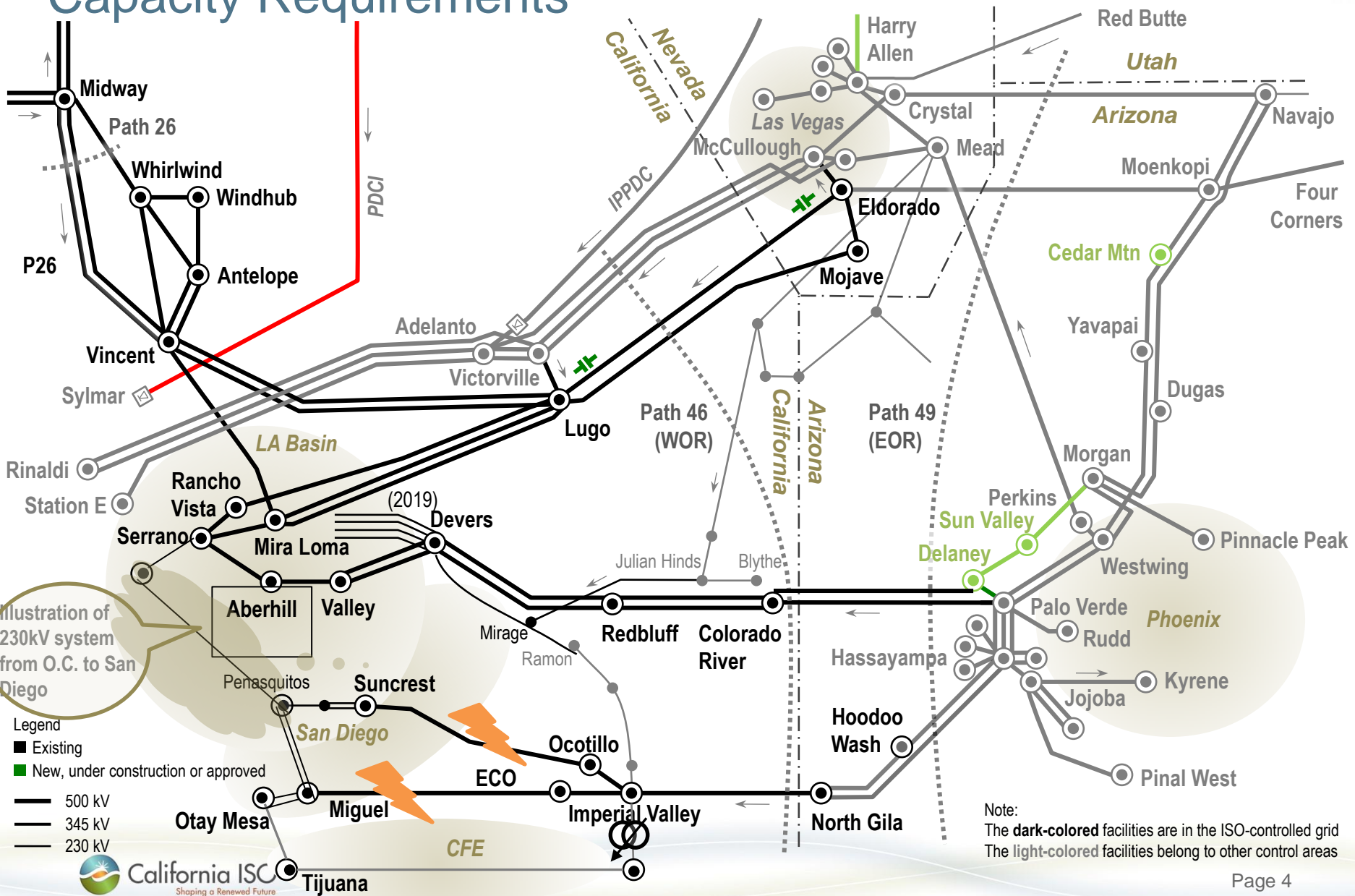
Los Angeles Basin and San Diego local capacity requirement areas



Notes:

*Assumed retired in the long-term LCR studies

Critical Contingency that Affects the Study Area Local Capacity Requirements



Local Capacity Requirements in the LA Basin Due to the Most Critical Contingencies

- Western LA Basin Sub-area

2024	QF (MW)	Wind (MW)	Muni (MW)	Market (MW)	RPS DG (MW)	DR (MW)	Max. Qualifying Capacity (MW)
Available existing resources	517	8	582	1,285	157	181	2,730

	Local Resource Capacity Needed (MW)	Deficiency without LTPP T1 & T4 and before “repurposing” DR (MW)	Incremental Resource Needs	
			Total SCE Selected Procurement for LTPP Tracks 1 & 4 (MW)	Additional Existing DR “Repurposed” Need (MW)
Category B* (Single)	4,486	-1,756**	1,892	0
Category C* (Multiple)	4,890	-2,160**	1,892	268

Notes:

*Category B contingency involves G-1 Otay Mesa and N-1 of Imperial Valley – N.Gila 500kV line (voltage instability); Category C contingency involves N-1-1 of Ocotillo-Suncrest 500kV, followed by ECO-Miguel 500kV line (thermal loading on IV phase shifters)

** Preliminarily assumed to be met by SCE’s procurement selection and “repurposing” of existing 268 MW (beyond the baseline assumptions of 181 MW) of demand response in the LA Basin

Local Capacity Requirements in the LA Basin Due to the Most Critical Contingencies (cont'd)

- Summary of SCE's and SDG&E's procurement for LTPP Tracks 1 and 4

2024 LTPP Tracks 1 & 4 Assumptions [^]	LTPP EE (MW)	Behind the Meter Solar PV (NQC MW)	Storage 4-hr (MW)	Demand Response (MW)	Conventional resources (MW)	Total Capacity (MW)
SCE-submitted procurement selection	130	44	261	75	1,382	1,892
SDG&E procurement	0	82*	25	0	600**	707

Notes:

[^] These assumptions represent utilities' procurement selection still subject to the CPUC approval for PPAs.

*ISO's assumptions of solar DG for preferred resources at this time; this will be updated further once detailed information is known from SDG&E's filing at the CPUC.

**This represents the assumptions for Carlsbad Energy Center (600 MW); Pio Pico generation project (300 MW) is assumed as existing generation in the long-term LCR studies since it already received PPA approval from the CPUC.

Local Capacity Requirements in the LA Basin Due to the Most Critical Contingencies (cont'd)

- Eastern Metro LA Basin Sub-area

2024	QF (MW)	Muni (MW)	Market (MW)	Wind (MW)	RPS DG (MW)	Max. Qualifying Capacity (MW)	2024
Available resources	165	581	1,122	0	22	1,890	Available resources

2024	Existing Resource Capacity Needed (MW)	Deficiency (MW)	Total MW Requirement
Category B* (Single)	1,890	0	1,890
Category C* (Multiple)	1,890	0	1,890

Notes:

*Category B contingency involves G-1 Otay Mesa and N-1 of Imperial Valley – N.Gila 500kV line (voltage instability); Category C contingency involves N-1-1 of Ocotillo-Suncrest 500kV, followed by ECO-Miguel 500kV line (thermal loading on IV phase shifters)

Local Capacity Requirements in the LA Basin Due to the Most Critical Contingencies (cont'd)

- Eastern LA Basin Sub-area

2024	QF (MW)	Wind (MW)	Muni (MW)	Market (MW)	RPS DG (MW)	Max. Qualifying Capacity (MW)	2024
Available generation	220	60	581	2,648	22	3,531	Available generation

2024	Existing Generation Capacity Needed (MW)	Deficiency (MW)	Total MW Requirement
Category B (Single)*	1,890	0	1,890
Category C** (Multiple)	3,460***	0	3,460

Notes:

*Category B contingency involves G-1 Otay Mesa and N-1 of Imperial Valley – N.Gila 500kV line (voltage instability);

**Category C (multiple) contingency involves N-1 of Serrano-Alberhill 500kV, followed by Devers – Red Bluff #1 & 2 500kV lines (voltage instability)

*** This represents an incremental 1,570 MW over the highest requirements in the Eastern Metro LA Basin sub-area

Local Capacity Requirements in the LA Basin Due to the Most Critical Contingencies (cont'd)

- Overall LA Basin LCR Need
 - W.LA + EMLA + Incremental for Eastern LA
- $$= 4,890 + 1,890 + 1,570 \text{ MW}$$
- $$= 6,780 \text{ MW} + 1,570 \text{ MW}$$
- $$= 8,350 \text{ MW}$$

Local capacity need caused by the same critical N-1-1 contingency that drives long-term local capacity procurement need

Local Capacity Requirements in the San Diego Sub-area Due to the Most Critical Contingencies

- San Diego sub-area need

2024	QF (MW)	Wind (MW)	Market (MW)	New DG (MW)	DR (MW)	Max. Qualifying Capacity (MW)
Available generation	164	9	2,121	67	17	2,378

2024	Total MW Requirement	Existing Resource Need (MW)	Deficiency without LTPP T1 & T4 (MW)	Total SDG&E Procurement for LTPP Track 4 (MW)
Category B* (Single)	3,078	2,378	700***	707
Category C** (Multiple)	3,078	2,378	700***	707

Notes:

*Category B contingency involves G-1 Otay Mesa and N-1 of Imperial Valley – N.Gila 500kV line (voltage instability);

**Category C involves N-1 Ocotillo Suncrest 500kV, followed by ECO-Miguel 500kV line (thermal loading constraint on the IV phase-shifters)

*** To be met by SDG&E's LTPP Track 4 procurement



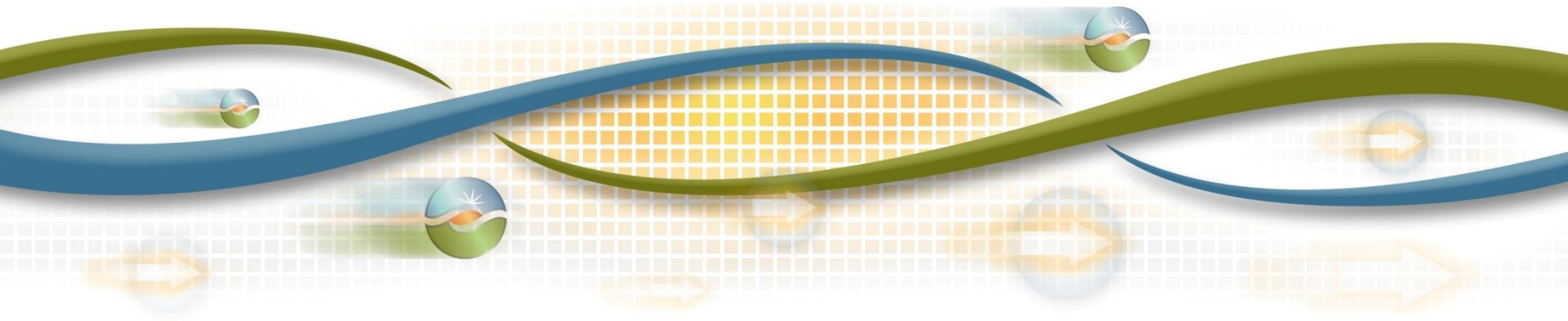
California ISO
Shaping a Renewed Future

Potential Southern CA Back-up Transmission Alternatives

Reliability Benefits for LA Basin & San Diego Area and Generation Deliverability Benefits for Imperial Country Area

Draft 2014-2015 ISO Transmission Plan Stakeholder Meeting

David Le
Senior Advisor Regional Transmission Engineer
February 17, 2015



Complex Interaction Between LA Basin/San Diego Reliability Needs an Imperial Area Deliverability

- LA Basin/San Diego reliability needs (LCR analysis):
 - Approved transmission and authorized procurement meet needs, however...
 - We need to consider backup or alternative plans due to the considerable uncertainty over the ultimate success of procurement of authorized preferred resources and other forecast assumptions.
- Imperial Area deliverability:
 - Approved transmission and recommended mitigations restore overall forecast deliverability to the area to pre-SONGS retirement levels, however,
 - Potential further development may exceed remaining forecast deliverability after considering projects already moving forward in ISO and in IID.

ISO Board approved transmission projects are scheduled to come on-line through 2020



Summary of Existing Preferred Resources Assumptions (AAEE, DR) for 2024 Long-Term LCR Studies

Area Name	AAEE (MW)	Utilized DR* (MW)	Total (MW)
LA Basin	1,146	181 - 449	1,327 - 1,595
SDG&E Area	338	17	355
Total	1,484	466	1,682 - 1,950

Notes:

*For use under overlapping contingency conditions (i.e., N-1-1) with demand response needing to be “repurposed” for response; the demand response needs to be made available for use within 20 minutes, with dispatchers taking up another 10 minutes for processing the contingency and coordinating response.

Summary of Long-Term Procurement Tracks 1 and 4

2024 LTPP Tracks 1 & 4 Assumptions [^]	LTPP EE (MW)	Behind the Meter Solar PV (NQC MW)	Storage 4-hr (MW)	Demand Response (MW)	Conventional resources (MW)	Total Capacity (MW)
SCE-submitted procurement selection	130	44	261	75	1,382	1,892
SDG&E procurement	0	82*	25	0	600**	707

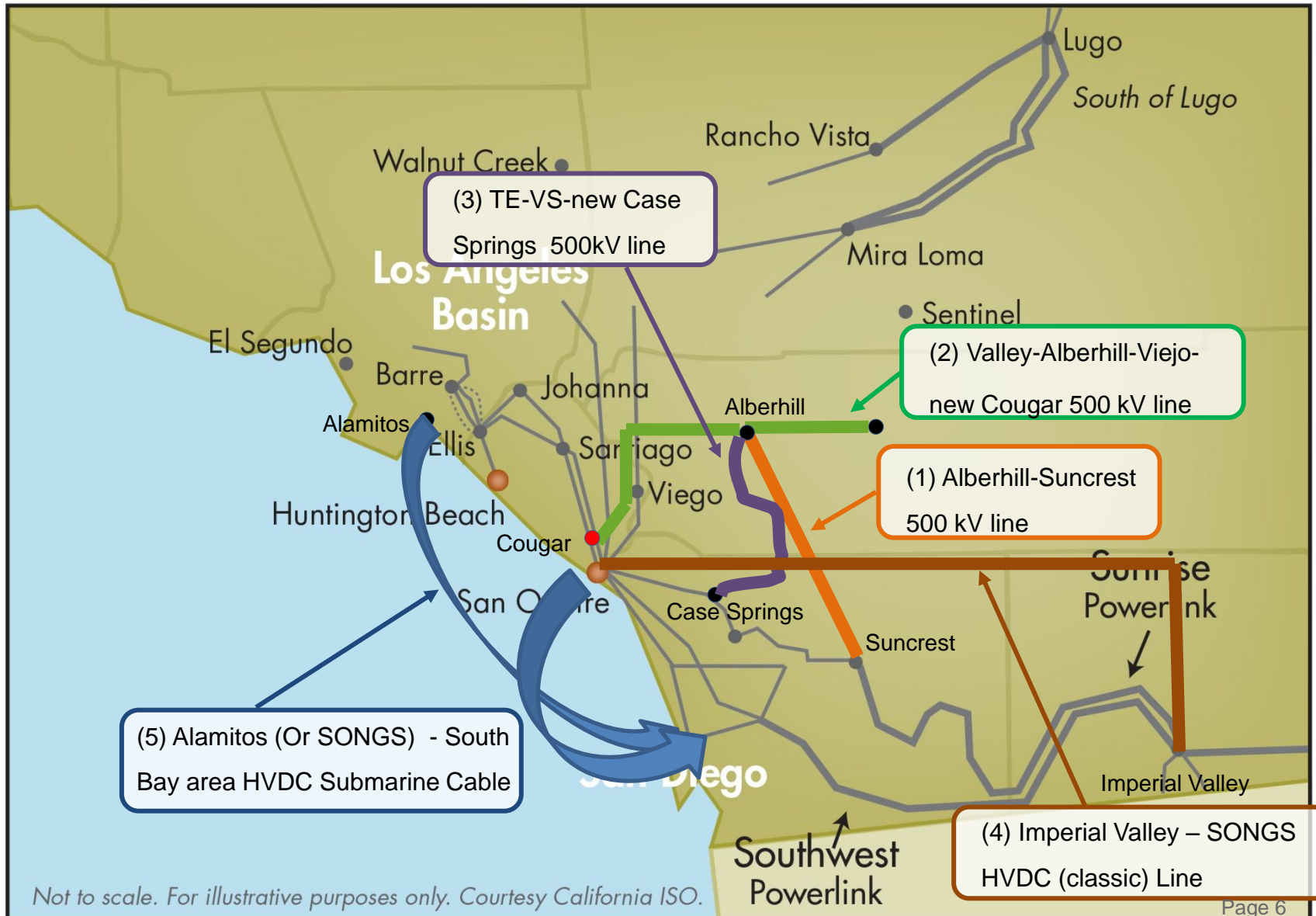
Notes:

[^] These assumptions represent utilities' procurement selection still subject to the CPUC approval for PPAs.

*ISO's assumptions of solar DG for preferred resources at this time; this will be updated further once detailed information is known from SDG&E's filing at the CPUC.

**This represents the assumptions for Carlsbad Energy Center (600 MW); Pio Pico generation project (300 MW) is assumed as existing generation in the long-term LCR studies since it already received PPA approval from the CPUC.

Various Potential Transmission Back-up Alternatives Previously Considered In the 2013-2014 Transmission Planning Cycle



Characteristics of Potential Transmission Back-up Solutions

- Some transmission reinforcements that **strengthen** the LA Basin and San Diego connection provide reliability improvement for the LA Basin / San Diego area, but provide little or **no benefits** to improving **generation deliverability** from the Imperial area;
- Other transmission upgrade options provide Imperial area **deliverability** benefits but of little or **no local capacity** benefits (i.e., Midway – Devers 500kV line);
- Some larger **more comprehensive** transmission solutions have been proposed (i.e., STEP Hooper – SONGS DC Line);
- **Combination** of individual transmission segments that offer either deliverability or reliability benefits must also be considered for a larger integrated solution.

Key Elements for Considerations of Potential Transmission Back-up Solutions

- **Timing** and **emergency** of need for additional mitigation for both needs (i.e., reliability and generation deliverability);
- **Feasibility** of various developments, which can be drawn from the Imperial area consultation efforts at the ISO, as well as the CEC/Aspen high-level environmental assessment analysis;
- Potential benefits of a more **staged approach**, such as some transmission solutions that work well together but have standalone benefits as well. Examples of such options include the Midway – Devers 500kV AC (or DC line) and the Valley – Talega 500kV line, where the former primarily supports exports of renewables from the Imperial area, and the latter primarily supports the LA Basin and San Diego areas;

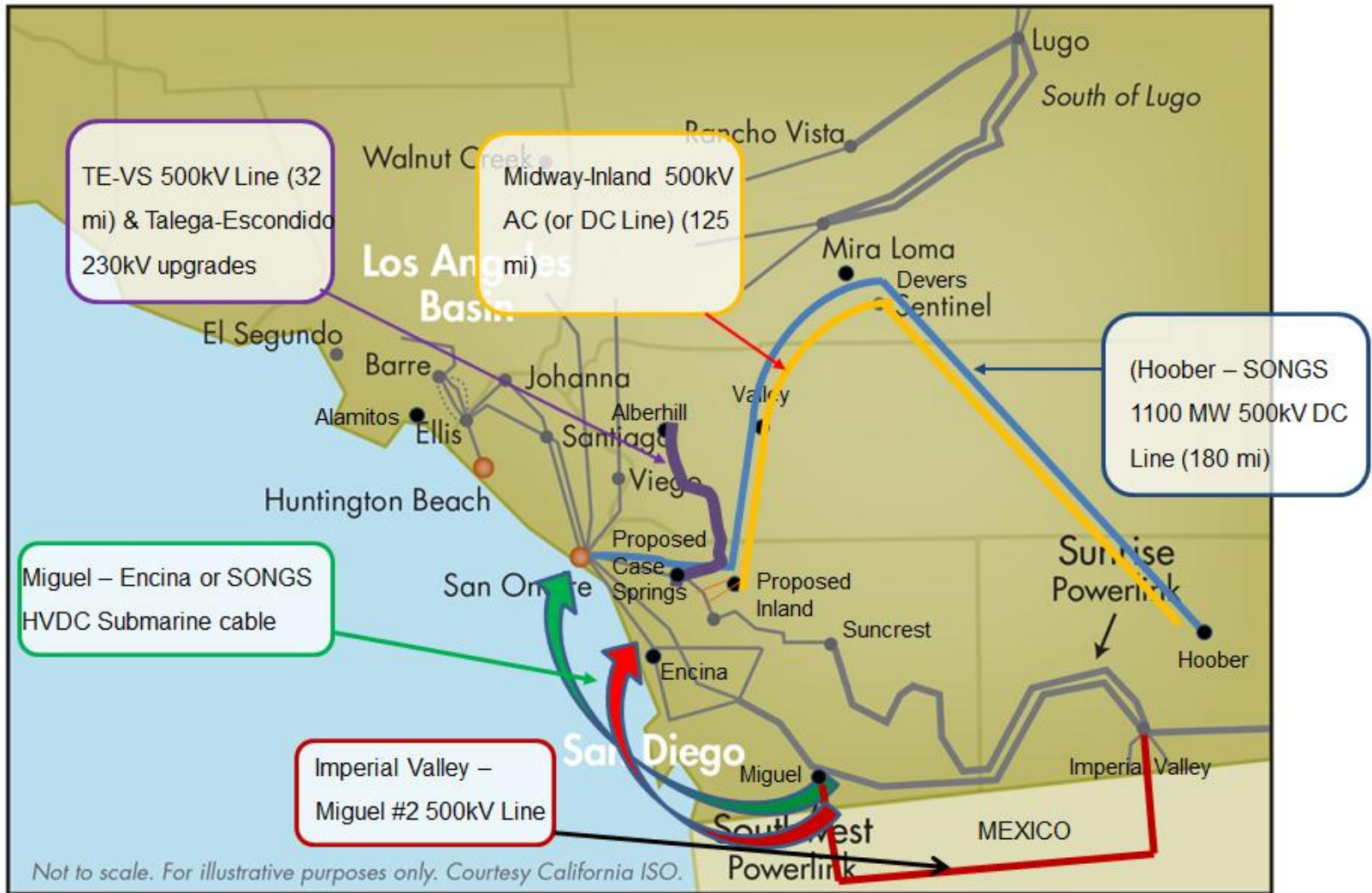
Key Elements for Considerations of Potential Transmission Back-up Solutions (cont'd)

- Future analysis that will be required as needs evolve, including consideration of a **larger picture that benefits** both California and Mexico clean energy objectives, such as the CFE – ISO Bulk 500kV AC or HVDC transmission option.
- Preliminary **siting information** from the CEC/Aspen report on “Transmission Options and Potential Corridor Designations in Southern California in Response to Closure of San Onofre Nuclear Generating Station”

Summary of Various Potential Backup Transmission Solutions for the LA Basin / San Diego Area

No	Transmission Solutions	High-Level Description	Estimated Potential LCR Benefits (MW)* (*In Case AAEE/DR Does Not Materialize as Forecast)	Provides Deliverability of 2500 MW Imperial Zone Sensitivity Renewable Portfolio?
1	STEP Hooper-SONGS DC Line	180-mi 1100 MW 500kV DC line from Hooper (IID) to SONGS (SDG&E)	1,062	yes
2	Midway-Inland 500kV*	125-mi 500kV 50% compensated line (if AC line) from Midway (IID) to Devers (SCE) and Valley (SCE) to Inland (SDG&E)	1,022	yes
3a	CFE-ISO Tie & Miguel-Encina DC Line	Combined 102-mi 500kV AC line and 94-mi underground/submarine 1000 MW 500kV bipole DC line to Encina (Upgradeable to 2000 MW in the future with some downstream 230kV upgrades)	798	yes
3b	CFE-ISO Tie & Miguel-HB DC Line	Combination of a 102-mi 500kV AC line and a 148-mi 1000 MW 500kV bipole DC line to HB; expandable to 2000 MW pending further needs in the future with some downstream 230kV facility upgrades	1,242	yes
3c	Staging approach: Phase 1 - CFE-ISO Tie & Laguna Bell Corridor SPS; Phase 2 - Miguel-HB DC Line (when further needs arise)	Phase 1 - 102-mi second IV - Miguel 500kV line with contingency-based SPS for Laguna Bell Corridor; Phase 2 - Miguel-HB DC Line (when further needs arise)	1,242	Phase 1: no Phase 1 and 2: yes
4	Talega-Escondido/Valley-Serrano (TE/VS) 500kV Interconnect*	About 32-mi of 500kV line connecting SCE's Alberhill Substation and new Case Springs Substation; Reconductor and install second set of SDG&E's Talega-Escondido 230kV line; Loop these lines into Case Springs substation	605^	no

High-level Illustrations of Potential Transmission Solutions for LA Basin/SD Reliability and Imperial Area Deliverability



Potential Scope of Works and High-Level Environmental Assessments

No	Transmission Solutions	High-Level Description	Detailed Line Segments	High-Level Non-Binding Costs (\$ Million)	CEC/Aspen High-Level Environmental Assessment
1	STEP Hooper-SONGS DC Line	180-mi 1100 MW 500kV DC line from Hooper (IID) to SONGS (SDG&E)	<ul style="list-style-type: none"> - Hooper-Devers 500kV DC - Devers-Valley 500kV DC - Valley-Inland 500kV DC - Inland-Talega/SONGS 500kV DC 	Total: \$ ~ 2,000	<ul style="list-style-type: none"> -Possible but Challenging -Challenging -Possible but Challenging -Challenging
2	Midway-Inland 500kV Line	125-mi 500kV 50% compensated line (if AC line)	<ul style="list-style-type: none"> - Midway-Devers 500kV AC or DC (90 mi) - Valley-Inland 500kV AC or DC (35 mi) - Construct new 230kV line between Escondido - Talega and loop into new Inland substation; reconductor existing Escondido - Talega 230kV line to higher rating 	<p>\$ 386 - 600 (cost for AC line)</p> <p>\$1,600 - \$1,900 (AC OH line)</p> <p>Total: \$1,986 - \$2,500</p>	<ul style="list-style-type: none"> -Possible but Challenging -Very Challenging (if overhead line) -Possible but Challenging (if underground line) -Challenging
3a	CFE-ISO Tie & Miguel-Encina DC Line	Combined 102-mi 500kV AC line and 94-mi underground/submarine 1000 MW 500kV bipole DC line to Encina (Upgradeable to 2000 MW in the future)	<ul style="list-style-type: none"> - Second Imperial Valley-Miguel 500kV line traversing CFE service territory (100 mi) - Install third Miguel 500/230kV bank (either at existing substation or at new adjoining substation located adjacent to it (new substation may be required since there is no more real estate for expansion at the existing substation) 	<p style="text-align: center;">\$911</p> <p style="text-align: center;">\$150</p>	<ul style="list-style-type: none"> -Siting located in Mexico

Potential Scope of Works and High-Level Environmental Assessments (cont'd)

No	Transmission Solutions	High-Level Description	Detailed Line Segments	High-Level Non-Binding Costs (\$ Million)	CEC/Aspen High-Level Environmental Assessment
			<ul style="list-style-type: none"> - New 2-mi double circuit 500kV line connecting Miguel substation to a new southern converter station - New 23-mi of bi-pole 500kV DC line from southern converter station to transition switching station 2-mile from the coast - New 71-mi submarine DC cable connecting southern converter station to Encina substation 	<p style="text-align: center;">\$2,645</p> <p style="text-align: center;"><u>Total: \$3,706</u></p>	<ul style="list-style-type: none"> -Siting located in California but near Mexico - Possible but challenging
3b	CFE-ISO Tie & Miguel-HB DC Line; (designed with high emergency rating for IV-Miguel 500kV line)	Combined 102-mi 500kV AC line and 148-mi 1000 MW 500kV bipole DC underground/submarine cable to Huntington Beach (Upgradeable to 2000 MW in the future)	<ul style="list-style-type: none"> - Second Imperial Valley-Miguel 500kV line traversing CFE service territory (100 mi) - Install third Miguel 500/230kV bank (either at existing substation or at new adjoining substation located adjacent to it (new substation may be required since there is no more real estate for expansion at the existing substation) - New 2-mi double circuit 500kV line connecting Miguel substation to a new southern converter station AND new 23-mi of bi-pole 500kV DC line from southern converter station to transition switching station 2-mile from the coast 	<p style="text-align: center;">\$911</p> <p style="text-align: center;">\$150</p> <p style="text-align: center;">\$2,850</p> <p style="text-align: center;"><u>Total: \$3,911</u></p>	<p style="text-align: center;">Siting located in Mexico</p> <p style="text-align: center;">Siting located in California but near Mexico Possible but Challenging</p>

Potential Scope of Works and High-Level Environmental Assessments (cont'd)

No	Transmission Solutions	High-Level Description	Detailed Line Segments	High-Level Non-Binding Costs (\$ Million)	CEC/Aspen High-Level Environmental Assessment
3c	CFE-ISO Tie & SPS (No Loss of Load Impact)	Construct 102-mi 500kV AC line and Install SPS in the LA Basin (no loss of load impact)	<p>- Second Imperial Valley-Miguel 500kV line traversing CFE service territory (100 mi)</p> <p>- Install third Miguel 500/230kV bank (either at existing substation or at new adjoining substation located adjacent to it (new substation may be required)</p> <p>-Install SPS to open Mesa 500/230kV AA bank(s) under N-1-1 contingencies to avoid overloading on Laguna Bell Corridor 230kV lines (notes: there is no loss of loads associated with this SPS)</p> <p>-Implement Ellis Corridor Upgrades (i.e., terminal equipment upgrades, line clearance mitigation)</p>	<p>\$911</p> <p>\$150</p> <p>Under \$50</p> <p>\$30</p> <p>Total: \$1,141</p>	<p>Siting located in Mexico</p> <p>No major siting requirements; works primarily involve installing fiber optics/communication lines between substations on existing transmission lines/towers.</p>

Potential Scope of Works and High-Level Environmental Assessments (cont'd)

No	Transmission Solutions	High-Level Description	Detailed Line Segments	High-Level Non-Binding Costs (\$ Million)	CEC/Aspen High-Level Environmental Assessment
4	TE/VS 500kV Line	Construct 32-mi of 500kV AC line to connect SCE's Alberhill Substation to new proposed Case Springs Substation (located in the SDG&E service area)	<ul style="list-style-type: none"> - Construct 32-mile of 500kV AC transmission line connecting SCE's Alberhill Substation to a new proposed Case Springs Substation (vicinity of Camp Pendleton) - Upgrade the existing Talega-Escondido 230kV line and loop into Case Springs substation - Construct a new second Talega-Escondido 230kV line and loop into Case Springs substation 	Total: \$850	Serious siting challenges

Summary of Findings

- Based on analyses performed for the potential back-up transmission solutions, the ISO considers that the two best back-up options (publicly available thus far), for addressing a ***potential resource development shortfall*** in the LA Basin/San Diego area and ***providing additional transmission deliverability*** for potentially higher levels of renewable generation from the Imperial area (i.e., the 2500 MW sensitivity scenario) are the following:

1. CFE – ISO Tie-Line

- If siting is viable in northern Mexico (i.e., CFE service area), the CFE-ISO Tie with Special Protection System concept (with no loss of load impact) under contingency condition provides the lowest cost and high LCR reduction benefits (i.e. AAEE/DR absences);

Summary of Findings (cont'd)

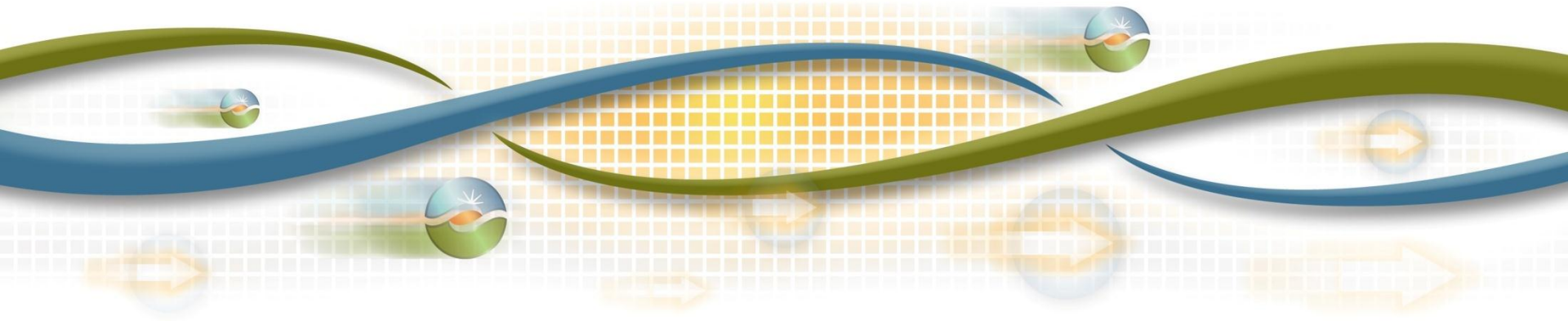
2. Midway-Inland

- For siting in California, the Midway-Inland concept provides the best balance of the options considered for cost, LCR reduction and Imperial renewable delivery benefits, and siting viability. Depending on route selection, undergrounding of transmission line may be required.
- Furthermore, this option provides the most flexibility to stage components (Devers-Inland versus Midway-Devers) to meet the two potential needs, respectively.
- These alternatives involve challenging rights of way and lengthy permitting and construction timelines.
- If currently anticipated resources fail to materialize, other short term mitigation plans will need to be considered to provide adequate time for transmission alternatives to be developed.
- Continued analysis will be required as needs evolve in future planning cycles.

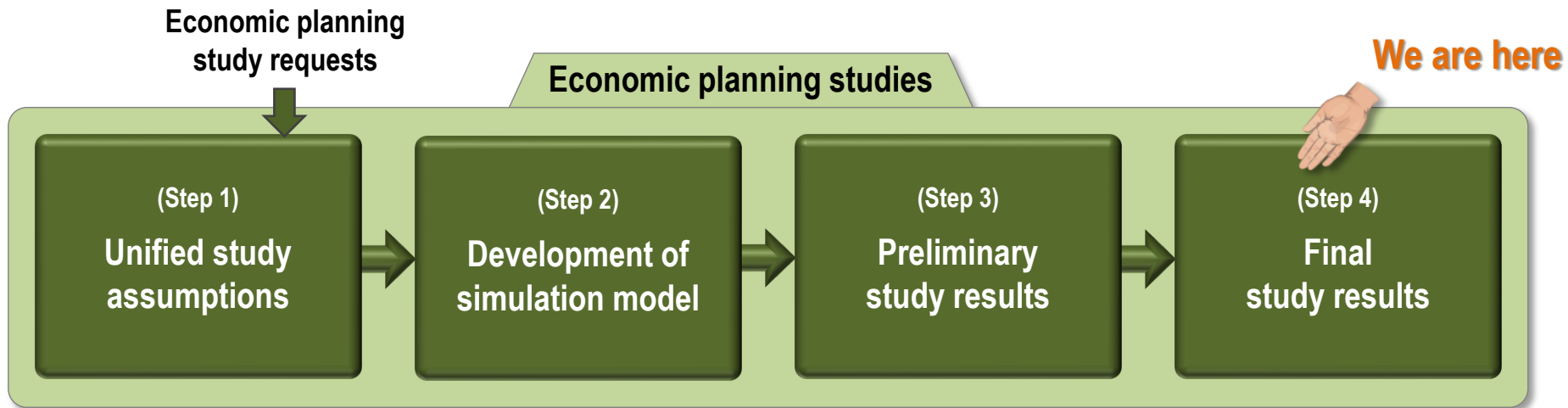
Economic Planning Study Recommendation

Draft 2014-2015 ISO Transmission Plan Stakeholder Meeting

Yi Zhang
Regional Transmission Engineer Lead
February 17, 2015



Steps of economic planning studies



Database development

Category	Type	2024	2019
Starting database		TEPPC 2024 V1.0 (8/1/2014)	CAISO 2024 database
Load	In-state load	CEC 2013 IEPR with AAEE forecast for 2024	CEC 2013 IEPR with AAEE forecast for 2019
	Out-of-state load	Latest WECC LRS 2012 forecast for 2024	Latest WECC LRS 2012 forecast for 2019
	Load profiles	TEPPC profiles	TEPPC profiles
	Load distribution	Four seasonal load distribution patterns	Four seasonal load distribution patterns
Generation	RPS	CPUC/CEC 2014 RPS portfolios	CPUC/CEC 2014 RPS portfolios - removed resources with in-service dates after 2019
	Once-Thru-Cooling	ISO 2014 Unified Study Assumptions	ISO 2014 Unified Study Assumptions
	Natural gas units	ISO 2014 Unified Study Assumptions	ISO 2014 Unified Study Assumptions
	Natural gas prices	CEC 2013 IEPR final (2024)	CEC 2013 IEPR final (2019)
	Other fuel prices	TEPPC fuel prices	TEPPC fuel prices
	GHG prices	CEC 2013 IEPR final (2024)	CEC 2013 IEPR final (2019)
Transmission	Reliability upgrades	Already-approved projects	Already-approved projects
	Policy upgrades	Already-approved projects	Already-approved projects
	Economic upgrades	Delany - Colorado River 500 kV line; Harry Allen - El Dorado 500 kV line	No
Other models	PacifiCorp-ISO EIM	Modeled	Modeled
	NVE-ISO EIM	Modeled	Modeled

Assumptions for financial analysis

- Calculation of cost
 - The estimation is made by $RR = 1.45 * CC$, where the multiplier is based on estimating ISO prior experience on California IOUs
 - This estimation approach is used only when project-specific analysis is not available at initial planning stage
 - Actual revenue requirements are calculated based on project-specific information conducted on a case-by-case basis
- Calculation of benefits
 - Same 7% discount rate as in cost calculation (5% sensitivity)
 - 0% escalation rate
 - Economic life span
 - 50 years for new build of transmission facilities
 - 40 years for upgrade of existing transmission facilities

Top 5 congestions of 2014~2015 planning cycle

Constraints Name	Area	2019		2024		Average cost (K\$)
		Costs (K\$)	Duration (Hrs)	Costs (K\$)	Duration (Hrs)	
Path 26	PG&E, SCE	2,259	297	3,214	237	2,737
CC SUB-C.COSTA 230 kV line #1	Greater Bay Area East	691	473	761	379	726
Path 15 Corridor (Path 15, Midway - Gates 500 kV and 230 kV lines)	Central California	200	24	846	39	523
WESTLEY-LOSBANOS 230 kV line	North of Los Banos	73	26	345	49	209
LODI-EIGHT MI 230 kV line #1	PG&E	51	67	191	184	121

- The congestion costs in 2024 changed slightly
- No economic justifications for network upgrades were identified for congestions on the first four constraints in previous cycles
- Detail study for Lodi – Eight Mile 230 kV line upgrade
 - \$44M energy benefit, \$0 capacity benefit, \$10M total cost
 - BCR = 4.4

Lodi – Eight Mile 230 kV line upgrade

Limiting constraints:
Normal Condition

Limiting elements:

Lodi – Eight Mile 230 kV line conductor

Congestion hours

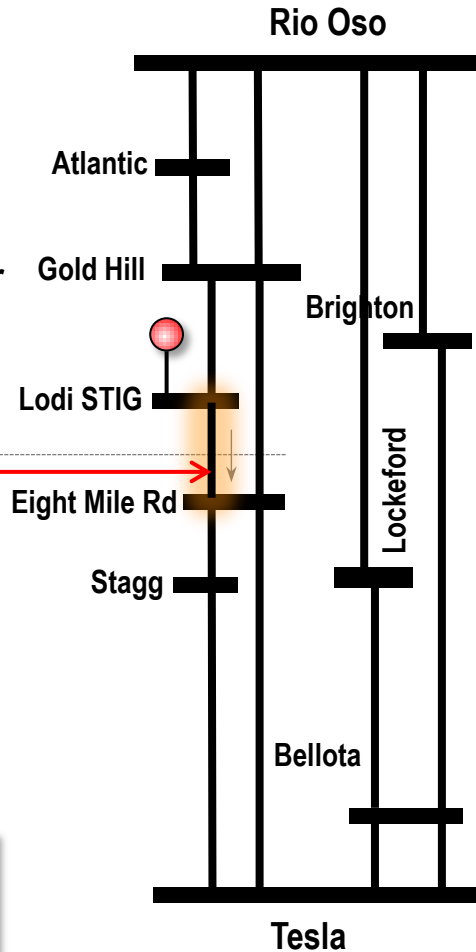
2019	2024
67	184

Costs (\$M)

CC	RR
7	10

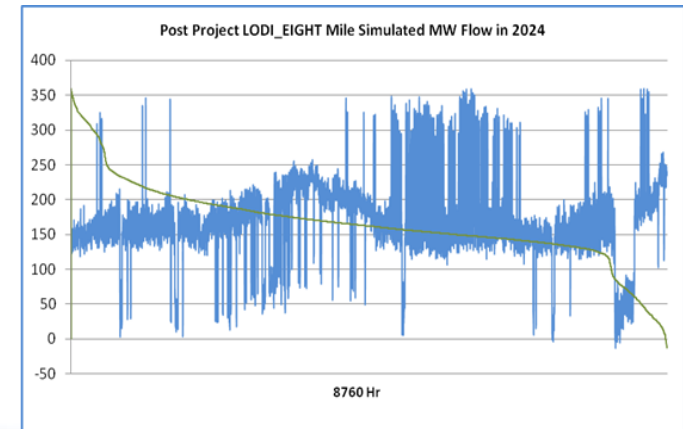
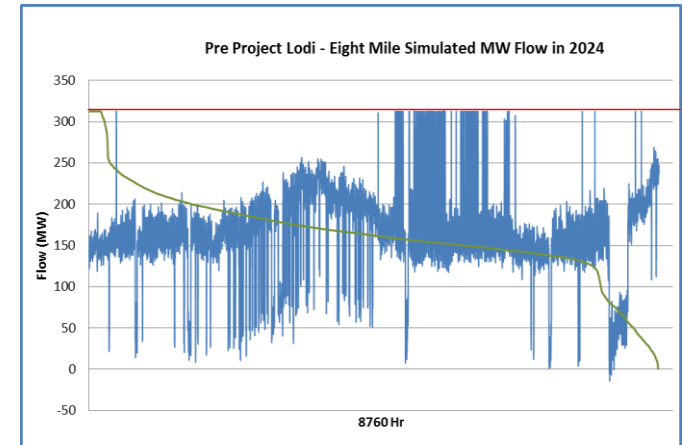
Benefits (\$M) and BCR

2019	2024	Total Benefit	BCR
4	3	44	4.4



Legend:

- generation
- 230 kV



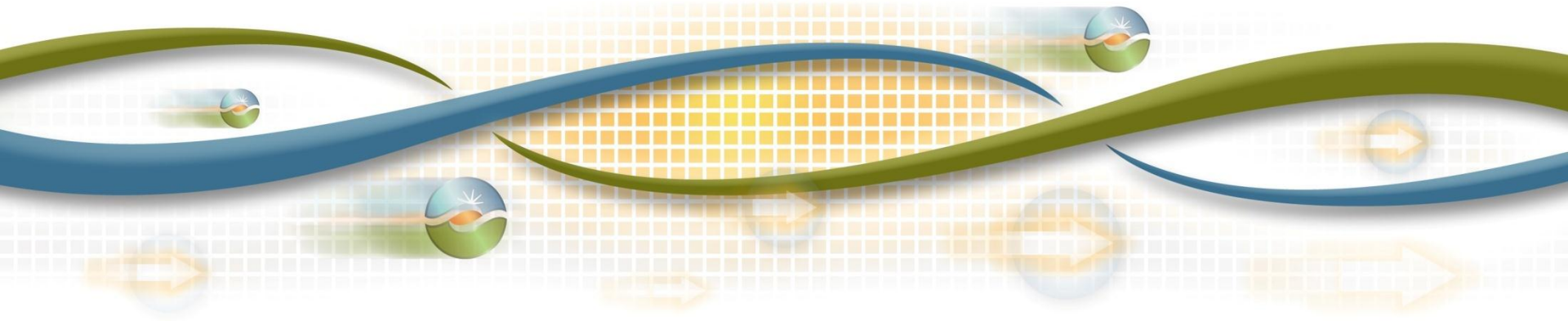
Summary

- Recommend to approve the reconductoring of the Lodi–Eight Mile 230 kV line as an economic-driven network upgrade.

Next Steps

Draft 2014-2015 ISO Transmission Plan Stakeholder Meeting

Tom Cuccia
Sr. Stakeholder Engagement and Policy Specialist
February 17, 2015



Next Steps

Date	Milestone
March 3	Stakeholder comments to be submitted to regionaltransmission@caiso.com
No later than March 19	Post Revised Draft 2014-2015 Transmission Plan
March 26-27	Present Revised Draft Plan to ISO Board of Governors
No later than March 31	Post Final 2014-2015 Transmission Plan