

CAISO South Regional Transmission Plan for 2006 (CSRTP-2006)

Status Briefing for STEP

Dariush Shirmohammadi
Director, Regional Transmission – South

July 24, 2006

Content

- **Objective**
- **Background**
 - Focus on Sun Path project in this round
- **CSRTP-2006 process**
 - CSRTP-2006 guiding principles
- **CSRTP-2006 assessment approach**
 - Reliability assessment
 - Economic assessment
 - RPS assessment
- **Findings for the Sun Path project**
- **Recommendations on Sun Path project**

Objective

- **Establish the CAISO South Regional Transmission Planning process (CSRTP-2006) to review, assess and determine potential improvements to the configuration of three major proposed transmission projects in Southern California (Tehachapi, LEAPS and Sun Path) based on the following principles:**
 - Assess the need for individual projects and for the interaction of these projects with one another by studying them simultaneously
 - Recommend proper course of action on all three projects to the CAISO Board by Q3, 2006
- **For this presentation, we will present our findings and recommendations on the Sun Path project only, but we account for the interaction of the other two projects with Sun Path**

CSRTP-2006 Background

Projects Background

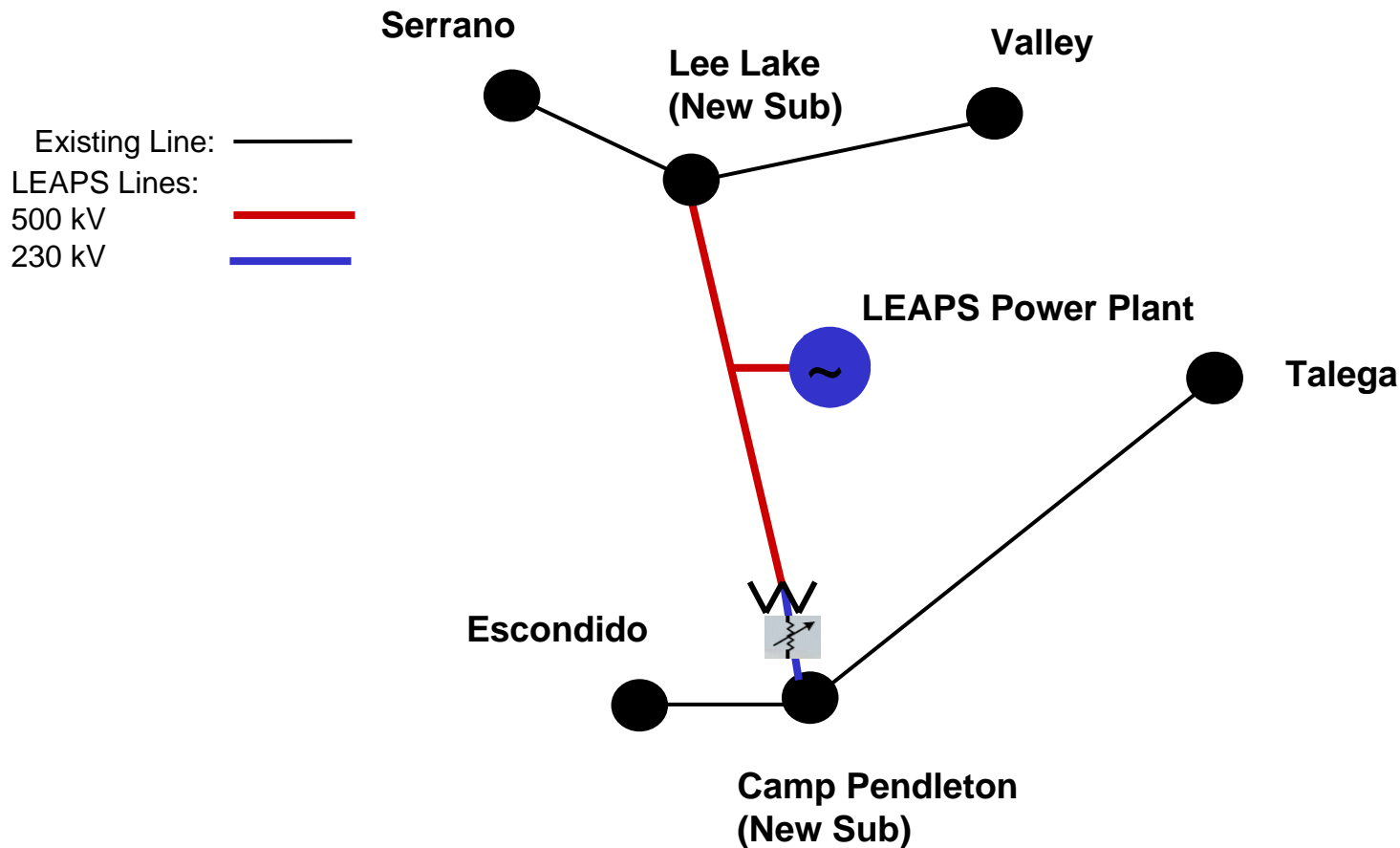
- **CAISO has been asked to assess three major transmission projects in Southern California Region:**
 - Tehachapi project: Transmission infrastructure to accommodate wind generation in Tehachapi area
 - LEAPS project: Lake Elsinore pumped storage plant and associated transmission line
 - Sun Path project: Combination of SDG&E's Sunrise Powerlink and Citizens Energy's and IID's Phase 2 Green Path projects connecting Imperial Valley to San Diego area
- **Each of these projects offers unique reliability and economic benefits**
 - All projects also play critical roles in enabling California to meet its Renewable Portfolio Standard (RPS) goals for 2010 and beyond

The Three Projects



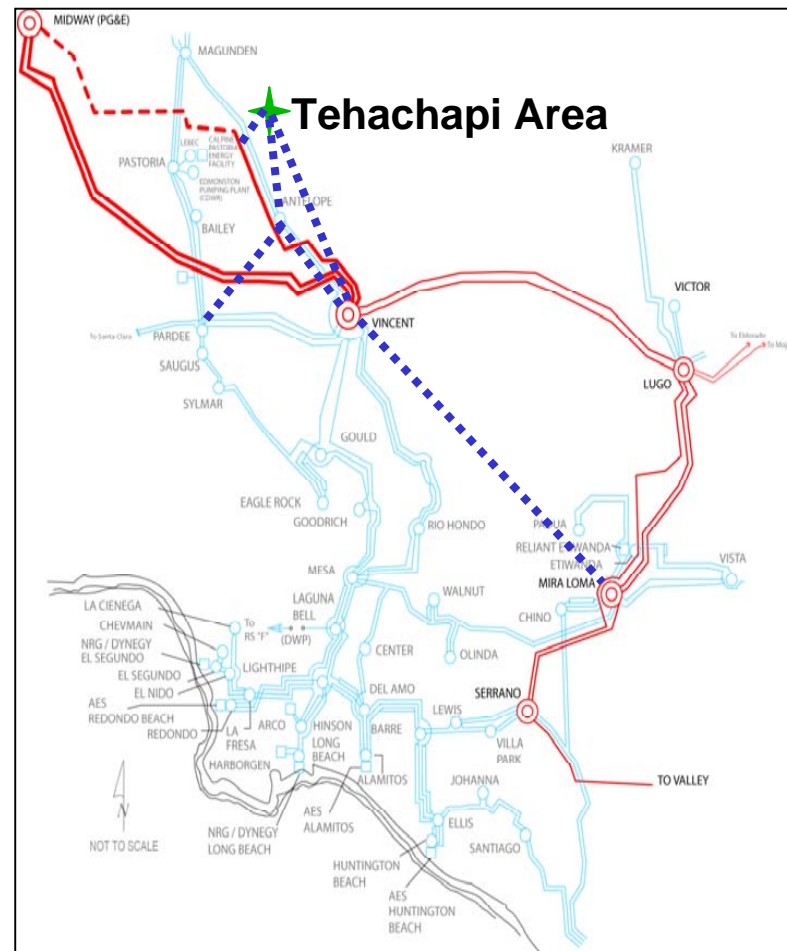


Plan of Service For Major Components of the LEAPS Project

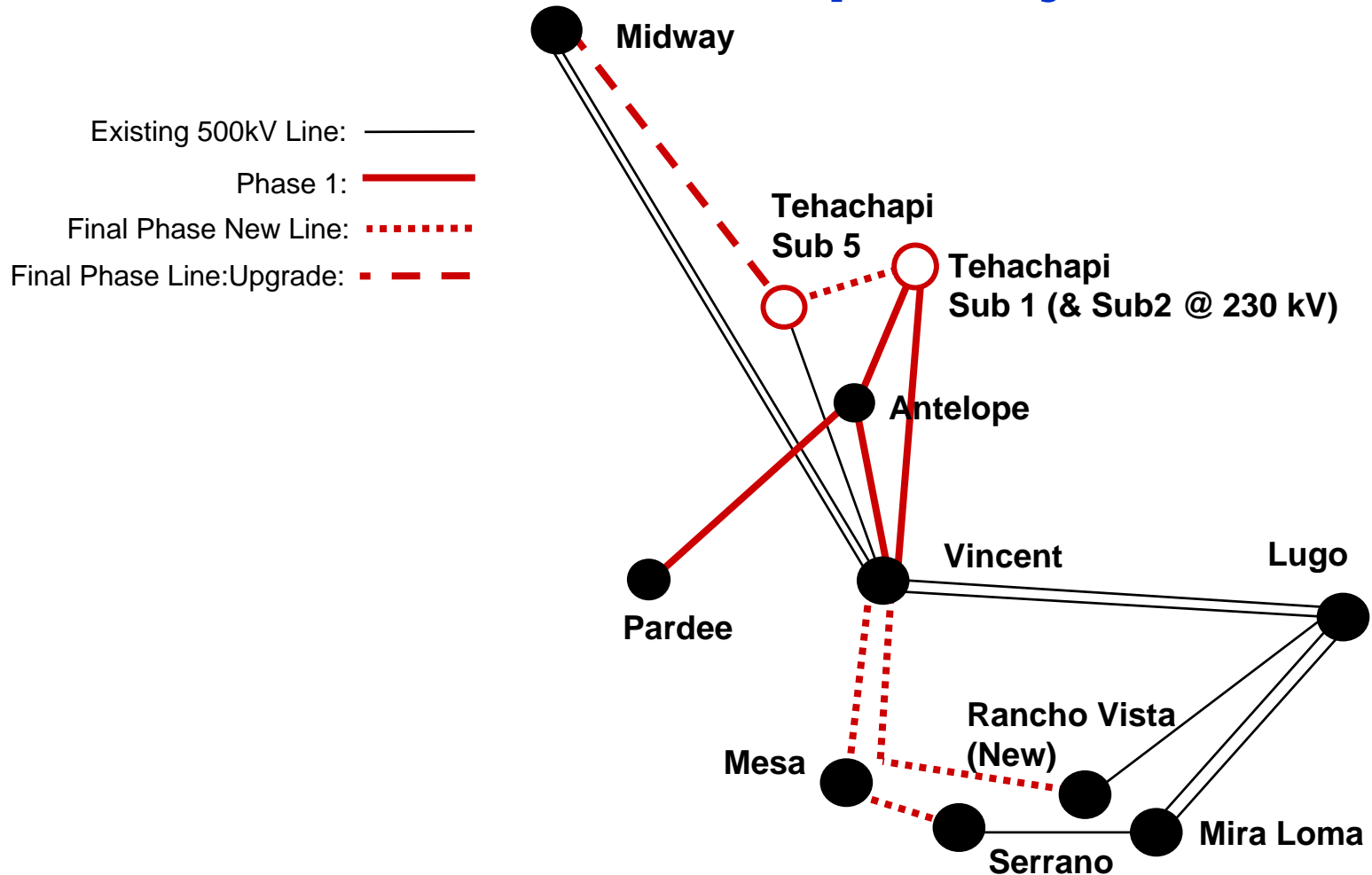


Tehachapi Project

- **A 500 kV transmission infrastructure in the Tehachapi wind generation area to interconnect developing wind generation in that area to the SCE (and the PG&E) transmission systems**
- **Purpose:**
 - Help California reach its RPS goals for the year 2010 and beyond
 - Facilitate access to wind resources in Tehachapi area
 - Improve the reliability of the CAISO South by mitigating congestion on Path 26 and offering new energy sources
 - Include reinforcements to the SCE system for additional flow on Path 26 as well as normal load growth in SCE area
 - Part of the transmission infrastructure may develop prior to full wind generation development
- **Project Sponsors: SCE and PG&E**
 - Wind generation developers play critical role

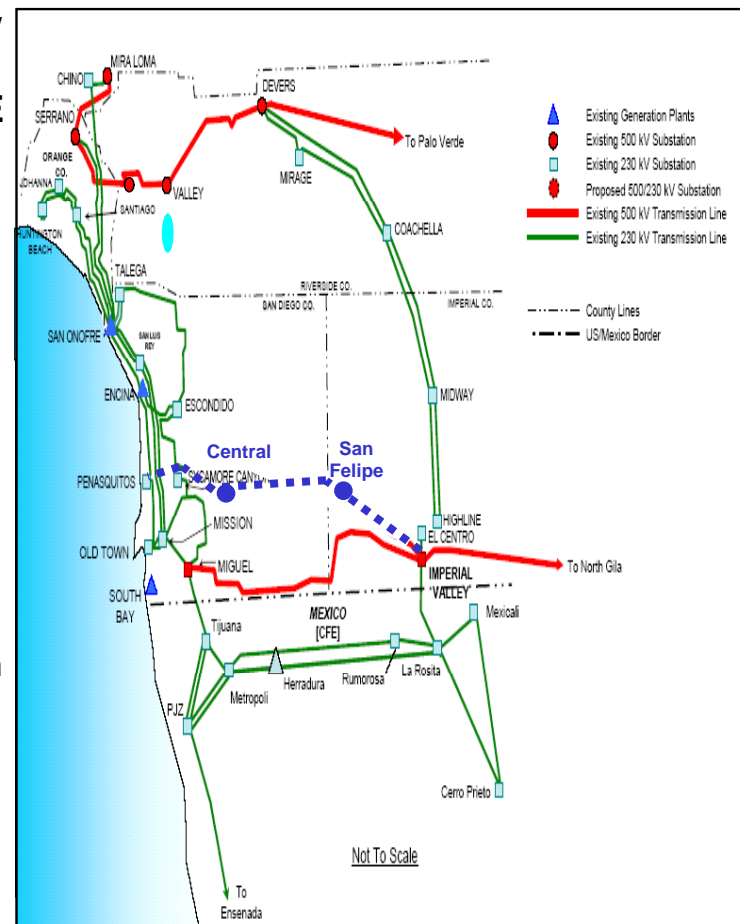


Plan of Service For Major Components of the Tehachapi Project



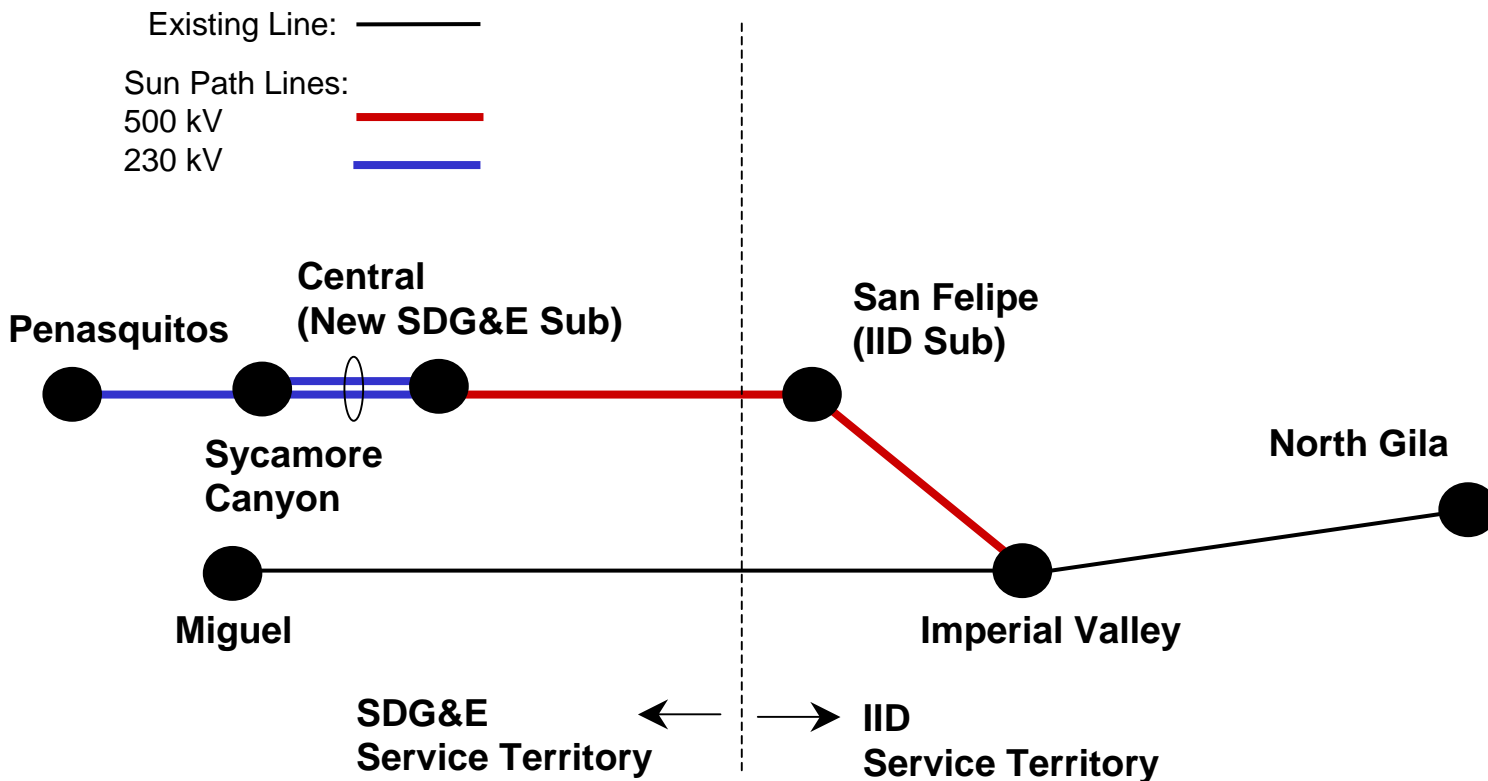
Sun Path Project

- A 500 kV link from the Imperial Valley (IV) sub to a new IID owned San Felipe Sub
- A 500 kV line from the San Felipe Sub to a new SDG&E owned Sub called “Central” in San Diego
- A double circuit 230 kV line from Central Sub to the existing Sycamore Sub
- A 230 kV line from Sycamore to Penasquitos Sub
- A 3rd San Luis Rey 230/69kV transformer
- Reconductoring of Sycamore Canyon–Elliott 69kV line
- A total of 240 MVAR reactive support at Central, San Luis Rey and South Bay subs.
- **Purpose:**
 - Facilitate access to renewable (geothermal & solar) resources in Salton Sea area without curbing economy imports into California
 - Improve reliability by increasing import capability into San Diego and reduce reliance on LCR/RMR
- **Project Sponsors: SDG&E and Citizen’s Energy/Imperial Irrigation District**
 - SDG&E would build and own the portion of the line & substations in SDG&E service territory, and a consortium of Citizen Energy and IID would build and own the line & substations in IID service territory





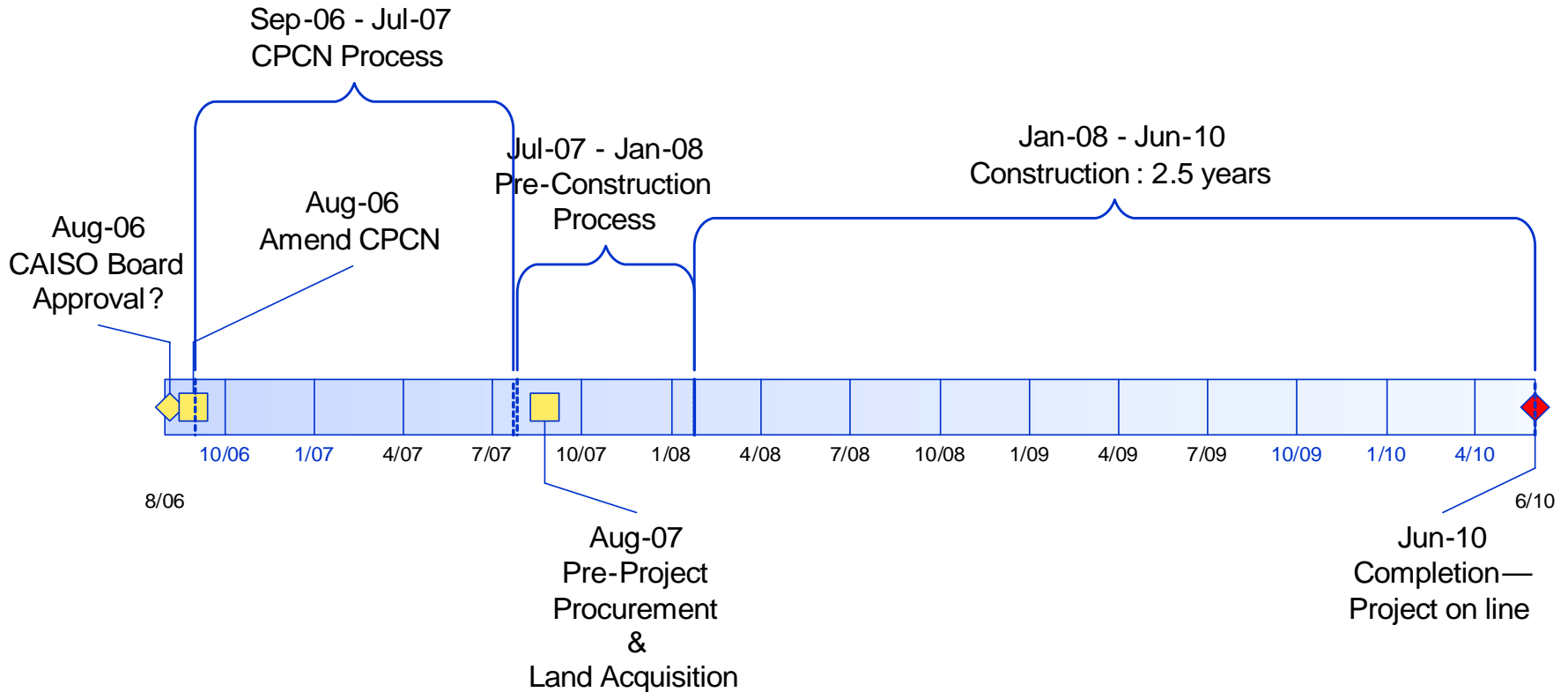
Plan of Service For Major Components of the Sun Path Project



CSRTP-2006 Study Timeline

- **We started the CSRTP-2006 process with a very aggressive timeline to assess all three proposed projects and present our findings/recommendations on them to the CAISO Board by Q3, 2006**
 - The aggressive timeline was set to help with completion of the critical components of the proposed projects, if approved by the CAISO Board, by 2010 in order to assist with meeting the state's RPS goals for the same year

CS RTP-2006 – Sun Path Project Timeline





One Project Before the Board in August Other Projects Presented in Q4, 2006

- **We bring one of the projects to the Board now since:**
 - Major changes in underlying system configuration took place halfway through of our studies and slowed the pace of our progress on all three projects
 - Scope of Tehachapi studies changed and expanded:
 - Draft complete plan of service for this project was only developed at the time of CSRTP launch – without full consensus among all parties
 - CSRTP-2006 process scope was then expanded to include South of Vincent (SOV) transmission reinforcements
 - SOV reinforcements were identified by SCE to address the added flow on Path 26 due to Tehachapi wind as well as for SCE load growth
 - Need direction from the FERC on the control of the LEAPS power plant before making a recommendation on the LEAPS project
 - CAISO's preliminary assessments have demonstrated potential for large short-term benefits from the power plant if the CAISO controls the power plant
 - However, there is potential for significant market distortions and long-term losses if the CAISO controls the LEAPS power plant
 - We need FERC's ruling on the treatment of the LEAPS power plant

Focus on Sun Path for This Round

- **Significant work was performed by SDG&E, IID and Citizens Energy on the plan of service for the Sun Path project (including the study of numerous alternatives) allowing us to focus on and complete our assessment of the project:**
- **There are no tariff complications with this project**
- **We present our findings and recommendations on the Sun Path under three scenarios:**
 - Scenario 1: Sun Path project considered alone
 - Scenario 2: Sun Path project considered in presence of the Tehachapi project
 - Scenario 3: Sun Path project considered in presence of the Tehachapi and LEAPS projects

Focus on Sun Path for This Round: SDG&E RPS Goals

- **Among California IOUs, SDG&E is farthest away from meeting its 2010 RPS Goal in relative terms partly due to transmission constraints into San Diego area**
 - Renewable deliveries to SDG&E in 2005:
 - SDG&E renewable delivery: 830 GWh*
 - SDG&E total retail delivery: 15,090 GWh
 - RPS goal reached: 5.54%
 - Required renewable deliveries to SDG&E in 2010:
 - SDG&E will need about 3,484 GWh to reach 20% RPS goal**
 - SDG&E has 977 GWh of contracted renewable energy
 - Additional required procurement 2,507 GWh
 - Correspond to additional capacity 572 MW (if CF*** = 50%)

* Source: CPUC

** SDG&E 2010 total retail delivery is forecasted to be 17,418 GWh

*** CF: Capacity Factor

Development of New Renewable Resources in Areas Impacted by the Proposed Projects*

Year	Resource Type	Tehachapi	Salton Sea
	Wind	4500 MW	
2010	Geothermal		445 MW
	Solar		300 MW
	Wind	4500 MW	
2015	Geothermal		1600 MW
	Solar		900 MW
	Wind	6000 MW	
2017	Geothermal		2000 MW
	Solar		900 MW

* Source: CS RTP project sponsors

CS RTP-2006 Process

CS RTP-2006 Process

- **Step 1: Formed technical study teams from project sponsors and impacted PTOs**
 - Formed three Technical Project Teams (TPTs) to cover the three projects
 - The three teams initially worked independently but later worked together on all projects
- **Step 2: Developed study assumptions and approaches**
 - Developed a uniform set of necessary assumptions and basecases to perform the reliability and economics assessments
 - Developed study methodology for the reliability and economics assessments
- **Step 3: Studied the three projects according to their “initial” plan of service in order to assess their individual reliability and economic values as well as to evaluate their interactions with one another**
 - Independently performed all critical reliability and economic studies including those already performed by the project sponsors
- **Step 4: Reviewing alternatives to individual project’s plan of service in order to optimize the recommended plan of service**
 - Completed the review of alternatives for Sun Path project

Guiding Principles for CS RTP-2006 Process

- **Perform studies based on data that can be shared on WECC level – NDA still required for some of the data**
- **Focus solely on the assessment of transmission solutions**
 - CS RTP-2006 process is NOT intended to:
 - Study path ratings
 - Study transmission line routing
 - Study generation or demand side alternatives
- **Provide opportunities to CS RTP-2006 participants to review and comment on the CAISO report**
 - Allow “minority report(s)” in the Board report
- **Inform participants if a decision or a recommendation is based on privileged information**

Public Participation in the CS RTP-2006 Process

- **While CS RTP-2006 participation was mainly limited to technical representation from project sponsors, the impacted PTOs, the CEC and EOB, we initiated several efforts to share our information with and receive input from all stakeholders:**
 - Sent out notices of events and comment opportunities to the CAISO, CPUC and STEP lists covering more than 3000 stakeholders
 - Organized an open house in San Diego to present CAISO's role in transmission projects and the CS RTP-2006 approach and interim results
 - Shared our reliability and economic assumptions by posting them on the CAISO website
 - Shared our basecases with CS RTP-2006 members as well as other stakeholders
 - Facilitated the processes to receive comments and suggestions on the study approach and transmission alternatives from all stakeholders and responded to all comments and suggestion openly
 - Modified the direction of our assessment based on such input
 - Presented our approach as well as our findings/recommendations at the Southwest Transmission Expansion Plan (STEP) meetings
 - Met with various public groups, including project opponents, at the San Diego Regional Energy Office to address their specific concerns about the CS RTP-2006 process and findings on the Sun Path project

CS RTP-2006 Assessment Approach

Overall Study Approach

- **Study various scenarios using the three proposed projects in their original plan of service one by one as well as in combination (two at a time and all three)**
 - Criteria used for our study:
 - Reliability performance
 - Economic performance
 - Account for California RPS goals mainly in phasing the projects
- **Identify one scenario/configuration (no, one, two, or three projects) that provides the most benefits considering all three performance areas as well as the cost of the projects**
- **Review and recommend alternative project configurations to be studied**
 - CAISO would study the new alternatives
 - Project sponsors to determine the cost of new alternatives
- **For this round we present the results for the Sun Path while accounting for the impact of the Tehachapi and LEAPS projects**

Criteria and Approach for Reliability Assessment of Transmission Projects

- **Assess reliability impact of each project based on the following principles:**
 - Verify that the identified reliability problem(s) that is to be solved by the project does exist
 - Verify that the identified reliability problem(s) is actually solved by the project
 - Determine that no other serious reliability issues are created by the project
 - Account for other reliability improvements due to the project
- **Verify whether the proposed project is the least cost solution to solving the identified reliability problem**
 - If true: We are done and economic assessments, if performed at all, are mainly intended to potentially improve plan of service
 - If false: Economic assessment must be performed on the project



Criteria and Approach for Economic Assessment of Transmission Projects

- **Assess whether over the project lifetime, its economic benefits to the CAISO Ratepayers* exceed its cost to the same ratepayers**
- **Benefits quantified in this assessment:**
 - Energy benefits: Quantified as the reduction in the CAISO Ratepayers' energy payment due to the transmission project
 - Locational capacity requirement (LCR) benefits: Quantified as the reduction in payments by the CAISO Ratepayers for meeting local capacity needs due to the transmission project
 - Due to insufficient data on upcoming locational capacity requirement programs that are to replace the existing RMR program, we will quantify this benefit in terms of savings in RMR payments
 - LCR/RMR payment actually quantifies the value of reliability
- **Benefits are quantified for two study years: 2010 and 2015**
 - Benefits for the years between study years are evaluated by linearly interpolating between the benefits in study years
 - Benefits beyond the study years are evaluated through extrapolation of the benefits in the study years using escalation factors mainly reflecting escalation in loads and fuel prices

* CAISO Ratepayers refers to the ratepayers of all utility members of the CAISO

Criteria and Approach for Economic Assessment of LEAPS Power Plant

- **Benefits of LEAPS power plant are being evaluated based on CAISO having control over the power plant:**
 - Energy benefits: Quantified as reduction in the CAISO Ratepayers' energy payments due to the operation of the LEAPS power plant
 - Ancillary services benefits: Quantified as reduction in ancillary services payments due to the same services that can be provided by the LEAPS power plant
 - There will be added benefits for regulation services 2010 and beyond due to forecasted large penetration of wind generation
 - Overgeneration mitigation benefits: Savings in payments for overgeneration mitigation due to project(s)
 - Black start & reactive power benefits: Savings in payments for black start capability & reactive power (not quantified) due to project(s)

Accounting for the State's RPS Goal

- **We account for the State's RPS goal mainly on decisions regarding the phasing of the projects**

Studying Transmission Alternatives

- **Principles for studying and recommending transmission alternatives:**
 - Transmission alternatives proposed by other parties are considered for analysis
 - Transmission alternatives that are actually studied are selected based on deliberations of the CS RTP-2006 team
 - Given the specifics of the proposed projects, Transmission alternatives are first studied based on their economic value
 - If the net economic benefit of a proposed alternative measured as the difference in its benefit and its cost for the study year is larger than that of the proposed project, reliability studies will be performed on that alternative
 - If the result of reliability assessment is acceptable for the proposed alternative, the impact of the alternative project on meeting the State RPS goal is evaluated
 - If the impact on meeting the State RPS goal is also acceptable, the proposed alternative is recommended in lieu of the project

Reliability Assumptions (1)

- **Reliability study scenarios from WECC**
 - 2010 Heavy Summer
 - 2015 Heavy Summer
 - 2011/12 Light Winter
- **List of critical contingencies for reliability studies**
 - 67 contingencies carefully selected
- **Base system configuration**
 - Existing system configuration accounting for relevant transmission and generation addition and retirements
 - Added new transmission: All transmission projects approved by the CAISO Board
 - Added new generation:
 - Generation under construction
 - Generation having received regulatory approval or signed contracts
 - All renewable resources per prior slide on “New Renewable Resources”
 - Retired generation: Official/public announcements
 - Re-powered generation: Treated as a sequence of generation retirement followed by generation addition

Reliability Assumptions (2)

- **Transmission path and nomogram constraints**
 - Based on existing WECC approved ratings
 - CAISO ratings for internal paths
 - Estimated the impact of the new project on interface ratings and the nomograms
- **A list of reliability and economic assumptions is posted on the CAISO Website**
 - URL:<http://www.caiso.com/1815/18159816f990.html>

Economic Assumptions (1)

- **Study the economic operation of the entire WECC system over the study year(s)**
 - Minimize production cost across the WECC based on least cost commitment/dispatch of all WECC resources
- **Deterministic scenario analysis**
- **Accounted for losses on marginal basis**
- **All studies conducted based on the most up-to-date WECC (formerly SSG-WI) economic data (available for 2015)**
 - WECC economic data was used without modifications
 - Exception: 1500 MW of new generation in Palo Verde area for 2010 and beyond was changed from Combustion Turbine to Combined Cycle
 - WECC generation production costs differences across regions seemed too low due to assumptions made for unit heat rates and regional gas price differentials
 - Hence calculated benefit for the projects should be conservative

Economic Assumptions (2)

- **CAISO put together a 2010 study year case (first year when all the projects are expected in service) based on 2015 data**
 - Scaled back load across WECC by about 2% a year
 - Generation scaled back accordingly on a regional basis
 - California load was further adjusted to account for CEC's latest load forecast
- **Accounted for average strategic bidding behavior for non-CAISO utility generators in PG&E and SCE areas**
 - Using the Residual Supply Index approach
 - No strategic bidding allowed in SDG&E area
 - No strategic bidding in 2010
- **Gas price (average price in 2006 dollar at Henry Hub):**
 - \$7/MMBTU for 2015
 - \$6.50/MMBTU for 2010
 - Monthly regional gas prices based on WECC data

Economic Assumptions (3)

- **Basecase energy benefit results were used for economic assessment**
 - Sensitivity analysis was performed to verify the suitability of this approach
 - Additional sensitivity analysis performed using:
 - Low and high gas prices
 - 2015: \$5/MMBTU for low and \$9/MMBTU for high
 - 2010: \$4.5/MMBTU for low and \$8.50/MMBTU for high
 - Low and high California load: -5% for low load and +5% for high load (both for 2015 and 2010 study years)
 - Low and high new renewable resources: -500 MW for low & +500 MW for for high (for 2015 only)
 - No strategic bidding for 2015
 - No strategic bidding for all 2010 cases
 - Generation re-power in 2015:
 - South Bay Power Plant: New CCCT 650 MW Plant
 - Encina Power Plant: New CCCT 640MW Plant
 - » Encina 1 & 2 retired

Studies for Sun Path

Study Area	Analysis & Modeling	Status
Reliability	Governor power flow simulations	Complete
	Transient stability simulations	Complete
Economic Benefit	Energy benefit assessment based on production cost savings	Complete
	LCR benefit assessment based on RMR payment savings	Complete
Study of alternatives	Economic studies followed by reliability studies if necessary	Complete

Sun Path Project Findings

Study Results for Sun Path Project

- **Reliability assessment results**
- **Economic assessment results**
 - Energy benefit assessment summary
 - LCR/RMR benefit assessment summary
 - Total and net benefit summary
- **RPS assessment discussion**
- **Study of alternatives**

Reliability Assessment results for Sun Path Project

- **SDG&E Import Study**
- **Other reliability considerations**

Reliability Assessment results for Sun Path Project -- SDG&E Import Study

	2010HS Pre-Project, All Lines In Service	2010HS Pre-Project, N-1 Conditions*	2010HS Sun Path Project, All Lines In Service	2010HS Sun Path Project, N-1 Condition***
CONTINGENCY	G-1: Otay Mesa	G-1: Otay Mesa N-1: IV-Miguel	G-1: Otay Mesa	G-1: Otay Mesa N-1: IV-Miguel
SDG&E LOAD (MW)	4906	4906	4906	4906
SDG&E INTERNAL GENERATION (MW)	2191	2196	2192	2193
SDG&E SYSTEM LOSSES (MW)	77	151	80	117
TOTAL SDG&E IMPORT (MW)	2792	2861	2794	2830
Surplus / (Deficient) (MW)	58	(361)	1206	670
Total Import Capability (MW)	2850	2500	4000	3500

*SPS for cross trip of the Imperial Valley – La Rosita 230kV line to help prevent overloading of CFE internal system.

** G-1 of Otay Mesa, system re-adjusted in the base case. The contingency analysis includes an N-1 on the Imperial Valley – Miguel 500kV line (N-1)

*** No need for cross trip SPS after implementing the Sun Path Project

Reliability Assessment results for Sun Path Project -- SDG&E Import Study

	2015HS Pre-Project, All-Lines In Service	2015HS Pre-Project, N-1 Condition	2015HS Sun Path Project, All-Lines In Service	2015HS Sun Path Project, N-1 Condition***	2015HS South Bay Re-power, All Lines In Service	2015HS South Bay Re-power, N-1 Condition*
CONTINGENCY	G-1: Otay Mesa	G-1:Otay Mesa N-1: IV-Miguel	G-1: Otay Mesa	G-1:Otay Mesa N-1: IV-Miguel	G-1: South Bay	G-1:South Bay N-1: IV-Miguel
SDG&E LOAD (MW)	5376	Case Diverged	5376	5376	5376	5376
SDG&E INTERNAL GENERATION (MW)	2193		2193	2194	2753	2759
SDG&E SYSTEM LOSSES (MW)	91		100	154	96	156
TOTAL SDG&E IMPORT (MW)	3274		3283	3336	2719	2773
Surplus / (Deficient) (MW)	(424)		717	164	131	(273)
Total Import Capability (MW)	2850		4000	3500	2850	2500

*SPS for cross trip of the Imperial Valley – La Rosita 230kV line to help prevent overloading of CFE internal system.

** G-1 of Otay Mesa, system re-adjusted in the base case. The contingency analysis includes an N-1 on the Imperial Valley – Miguel 500kV line (N-1)

*** No need for cross trip SPS after implementing the Sun Path Project



Reliability Assessment results for Sun Path Project

- **The Sun Path project increases the SDG&E import capability by about 1000 MW (SWPL out) to 1150 MW (all lines in service), which helps address expected shortfalls in the import capability and maintains reliable load serving capability in the San Diego area**
- **No adverse impacts result from the Sun Path Project**
 - Provides additional benefit by eliminating potential pre-project contingency overloading concerns on the CFE system with the La Rosita - HRA 230kV, La Rosita - Rumorosa 230kV, Rumorosa - HRA 230kV lines
 - Provides additional benefit by addressing thermal contingency overloading concerns on IID's internal transmission network on the Blythe - Niland 161kV, Knob - Pilot Knob 161kV, Pilot Knob-Highline 161kV and RTP-RTAP2 lines
- **The transient studies demonstrate no adverse impacts result and an additional reliability benefit:**
 - Provides additional benefit by mitigating the frequency criteria violations in the CFE system due to an N-1 contingency of Imperial Valley – Miguel 500kV line

Sun Path Project Energy Benefits for 2015

Energy Benefit for year 2015 (in Millions of 2006\$)

	Sunpath Benefit	Sunpath Benefit in Presence of Tehachapi	Sunpath Benefit in Presence of LEAPS & Tehachapi
Total CAISO IOU Generator Surplus Gain (Loss)	(40.42)	(34.47)	(48.69)
Total CAISO Consumer Payment Reduction (Increase)	185.12	159.31	194.54
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.05)	(0.05)	(4.87)
Total CAISO Benefit (Loss)	144.65	124.79	140.99
Total WECC Production Cost Reduction (Increase)	60.95	65.66	83.36

Sun Path Energy Benefit Sensitivity to California Load (2015)

Energy Benefits with Load Sensitivity - 2015 (in Millions of 2006\$)

Benefit Description	Sun Path Benefit - 2015 Base Case	Sun Path Benefit with 5% Higher CAISO 2015 Load	Sun Path Benefit with 5% Lower CAISO 2015 Load
Total CAISO IOU Generator Surplus Gain (Loss)	(40.42)	(40.49)	(33.09)
Total CAISO Consumer Payment Reduction (Increase)	185.12	208.49	153.59
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.05)	(8.21)	(7.13)
Total CAISO Benefit (Loss)	144.65	159.79	113.37
Total WECC Production Cost Reduction (Increase)	60.95	66.54	67.95

Sun Path Energy Benefit Sensitivity to Gas Prices (2015)

Energy Benefits with Gas Price Sensitivity - 2015 (in Millions of 2006\$)

Benefit Description	Sun Path Benefit - 2015 Base Case	Sun Path Benefit with High Gas Prices	Sun Path Benefit with Low Gas Prices
Total CAISO IOU Generator Surplus Gain (Loss)	(40.42)	(50.11)	(24.84)
Total CAISO Consumer Payment Reduction (Increase)	185.12	229.30	89.19
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.05)	3.02	(1.69)
Total CAISO Benefit (Loss)	144.65	182.21	62.66
Total WECC Production Cost Reduction (Increase)	60.95	103.98	85.71

Sun Path Energy Benefit Sensitivity to Salton Sea Renewable Resources (2015)

Energy Benefits with Renewable Resource Sensitivity - 2015 (in Millions of 2006\$)

Benefit Description	Sun Path Benefit - 2015 Base Case	Sun Path Benefit with additional Renewables: +300MW Geo, +200MW Solar	Sun Path Benefit with less Renewables: -300MW Geo, -200MW Solar
Total CAISO IOU Generator Surplus Gain (Loss)	(40.42)	(37.45)	(36.11)
Total CAISO Consumer Payment Reduction (Increase)	185.12	147.97	164.87
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.05)	63.38	(5.34)
Total CAISO Benefit (Loss)	144.65	173.90	123.41
Total WECC Production Cost Reduction (Increase)	60.95	173.68	33.90

Sun Path Energy Benefit Sensitivity to Strategic Bidding (2015)

Energy Benefits with Marginal Cost Bidding Scenario – 2015 (in Millions of 2006\$)

Benefit Description	Sun Path Benefit - 2015 Base Case	Sun Path Benefit using Marginal Cost Bidding
Total CAISO IOU Generator Surplus Gain (Loss)	(40.42)	(33.39)
Total CAISO Consumer Payment Reduction (Increase)	185.12	165.52
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.05)	(2.87)
Total CAISO Benefit (Loss)	144.65	129.26
Total WECC Production Cost Reduction (Increase)	60.95	74.38

Sun Path Energy Benefit Sensitivity to San Diego Area Generation Re-Powering (2015)

Energy Benefits with Generation Re-power Scenario in 2015 (in Millions of 2006\$)

- South Bay: Replace the existing power plant with a 650 MW CC unit
- Encina: Replace Encina 1 & 2 (~200 MW) with a 640 MW CC unit

Benefit Description	Sun Path Benefit - 2015 Base Case	Sun Path Benefit with South Bay Re-power	Sun Path Benefit with Encina Re-power
Total CAISO IOU Generator Surplus Gain (Loss)	(40.42)	(31.09)	(31.02)
Total CAISO Consumer Payment Reduction (Increase)	185.12	147.22	148.08
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.05)	(1.92)	(1.63)
Total CAISO Benefit (Loss)	144.65	114.21	115.42
Total WECC Production Cost Reduction (Increase)	60.95	72.24	82.74

Sun Path Project Energy Benefits for 2010

Energy Benefit for year 2010 (in Millions of 2006\$)

	Sunpath Benefit	Sunpath Benefit in Presence of Tehachapi	Sunpath Benefit in Presence of LEAPS & Tehachapi
Total CAISO IOU Generator Surplus Gain (Loss)	(18.28)	(7.46)	(12.85)
Total CAISO Consumer Payment Reduction (Increase)	61.63	39.21	56.36
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.37)	(5.91)	(5.54)
Total CAISO Benefit (Loss)	42.97	25.83	37.97
Total WECC Production Cost Reduction (Increase)	3.20	8.73	11.70

Sun Path Energy Benefit Sensitivity to California Load (2010)

Energy Benefits with Load Sensitivity - 2010 (in Millions of 2006\$)

Benefit Description	Sun Path Benefit - 2010 Base Case	Sun Path Benefit with 5% Higher CAISO 2010 Load	Sun Path Benefit with 5% Lower CAISO 2010 Load
Total CAISO IOU Generator Surplus Gain (Loss)	(18.28)	(17.56)	(15.67)
Total CAISO Consumer Payment Reduction (Increase)	61.63	68.66	38.48
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.37)	(8.31)	1.39
Total CAISO Benefit (Loss)	42.97	42.78	24.19
Total WECC Production Cost Reduction (Increase)	3.20	1.90	8.70

Sun Path Energy Benefit Sensitivity to Gas Prices (2010)

Energy Benefits with Fuel Price Sensitivity - 2010 (in Millions of 2006\$)

Benefit Description	Sun Path Benefit - 2010 Base Case	Sun Path Benefit with High Gas Prices	Sun Path Benefit with Low Gas Prices
Total CAISO IOU Generator Surplus Gain (Loss)	(18.28)	(11.55)	(10.33)
Total CAISO Consumer Payment Reduction (Increase)	61.63	51.33	45.39
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.37)	(7.17)	(6.77)
Total CAISO Benefit (Loss)	42.97	32.61	28.29
Total WECC Production Cost Reduction (Increase)	3.20	8.06	8.40

Sun Path Energy Benefit Sensitivity to Renewable Development in Salton Sea in 2010

Energy Benefits with Renewable Resource Sensitivity - 2010 (in Millions of 2006\$)

Benefit Description	Sun Path Benefit - 2010 Base Case	Sun Path Benefit with No New Salton Sea Renewables* in Pre-Project Case
Total CAISO IOU Generator Surplus Gain (Loss)	(18.28)	(36.09)
Total CAISO Consumer Payment Reduction (Increase)	61.63	115.47
Total CAISO PTO Transmission Congestion Revenue Gain (Loss)	(0.37)	0.41
Total CAISO Benefit (Loss)	42.97	79.80
Total WECC Production Cost Reduction (Increase)	3.20	208.94

*Pre-Project New Renewables: 0MW (745 MW available)



Local Capacity Requirement (LCR) Benefit of Sun Path Project

Year	Load	Estimated Import limit			Largest Unit
		No new projects	with Sunpath	with Sunpath and LEAPS	
2010	4971 MW	2500 MW	3500 MW	4500 MW	561 MW
2015	5192 MW	2500 MW	3500 MW	4500 MW	561 MW

Year	RMR Need			Available Resources	Required RMR Generation		
	No New Projects	With Sunpath	With Sunpath and LEAPS		No New Projects	with Sunpath	With Sunpath and LEAPS
2010	3032 MW	2032 MW	1032 MW	1380 MW	1652 MW	652 MW	0 MW
2015	3253 MW	2253 MW	1253 MW	1380 MW	1873 MW	873 MW	0 MW

LCR Benefit of Sun Path Project

RMR Benefits

(in Millions of 2006\$)

	Year 2010	Year 2015
RMR cost, no new projects	\$71.55M*	\$81.12M
RMR cost with Sun Path	\$28.24M	\$37.81M
RMR cost with Sun Path and LEAPS	\$0	\$0
Sun Path RMR savings	\$43.31M	\$43.31M
RMR savings with Sun Path and LEAPS	\$71.55M	\$81.12M
RMR savings attributed to each project	\$35.78M**	\$40.56M**

* All benefits calculated based on CAISO's 2-year average RMR capacity payment of \$43.31/kW-yr for San Diego Area

** We have divided the savings equally between the two projects

Total Ratepayers Benefits of Sun Path Project: Sun Path Alone

**Sun Path Project Total CAISO Ratepayers Benefits Summary
When Alone (in Millions of 2006 dollars)**

Benefits	2010 CAISO Ratepayer Benefit	2015 CAISO Ratepayer Benefit
- Energy Benefit	\$42.97	\$144.65
- LCR/RMR Benefit	\$43.31	\$43.31
Total Benefit	\$86.28	\$187.96

Total Ratepayers Benefits of Sun Path Project: With Tehachapi

**Sun Path Project Total CAISO Ratepayers Benefits Summary
when with Tehachapi Project (in Millions of 2006 dollars)**

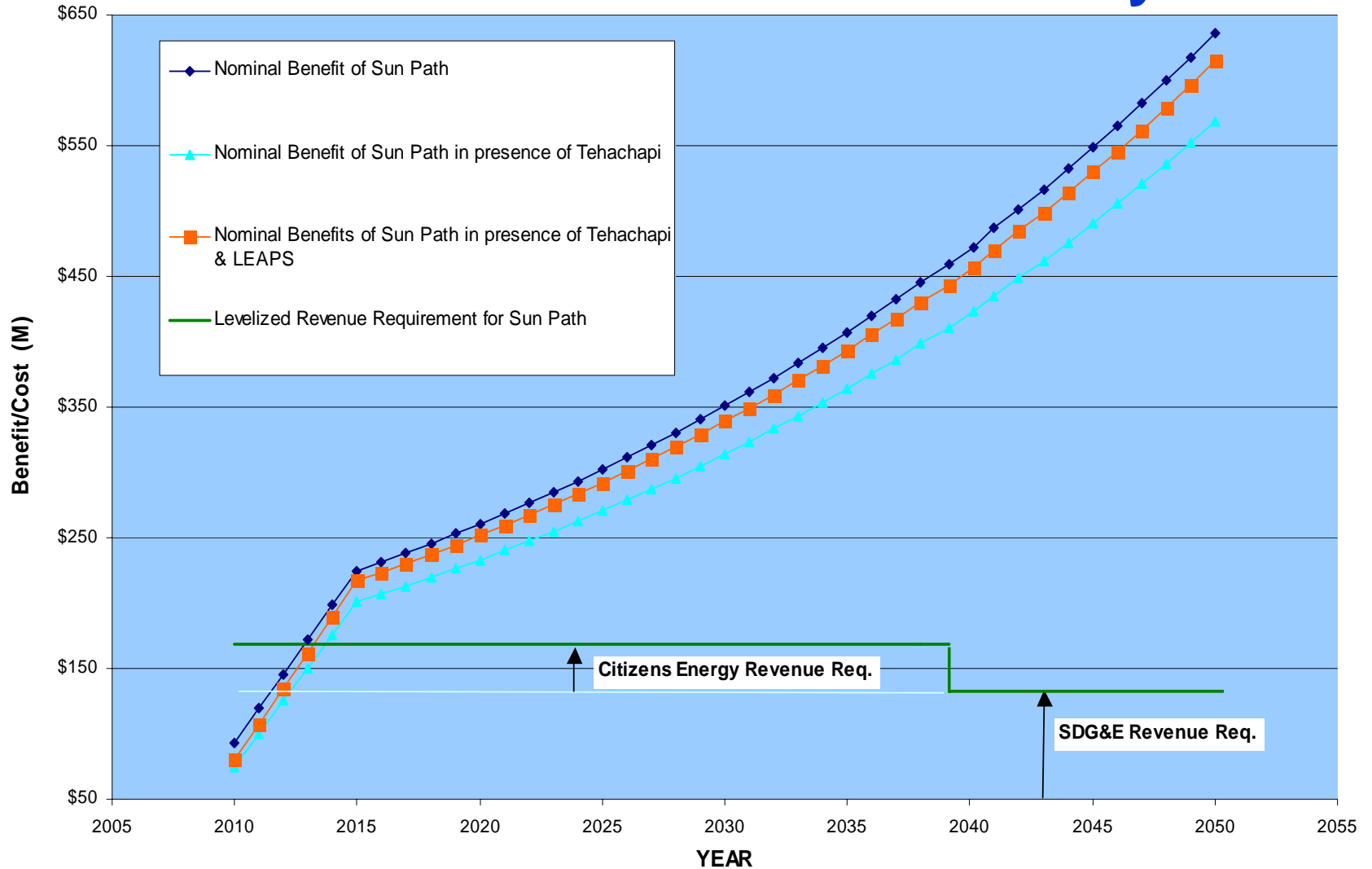
Benefits	2010 CAISO Ratepayer Benefit	2015 CAISO Ratepayer Benefit
- Energy	\$25.83	\$124.79
- RMR/LCR	\$43.31	\$43.31
Total	\$69.14	\$168.10

Total Ratepayers Benefits of Sun Path Project: With Tehachapi & LEAPS

**Sun Path Project Total CAISO Ratepayers Benefits Summary
when with Tehachapi & LEAPS Projects
(in Millions of 2006 dollars)**

Benefits	2010 CAISO Ratepayer Benefits	2015 CAISO Ratepayer Benefits
- Energy	\$37.97	\$140.99
- RMR/LCR	\$35.78	\$40.56
Total	\$73.75	\$181.55

Economic Assessment of Sun Path Project: Annual Cost/Benefits Summary



Alternatives Assessed by CAISO

- **Mexico Light – Bundled along with LADWP-proposed Indian Hills – Upland 500kV Transmission Line Project**
- **SONGS Light Transmission**
- **SONGS Heavy Transmission**

CAISO Alternatives Assessments

Transmission Alternatives	Assessment Results
<p>Mexico Light – Bundled with LADWP proposed Indian Hills – Upland 500kV Transmission Line Project</p>	<p>LADWP Portion:</p> <ul style="list-style-type: none"> • Could not receive any certainty on the schedule or plan of service for LADWP proposed Indian Hills – Upland 500kV Transmission Line Project <p>Mexican Portion:</p> <ul style="list-style-type: none"> • Mexican portion adds 18% overload on La Rosita plant to La Rositado sub • Does not allow for long-term mitigation of the import capability concern for SDG&E area • Will not help with economic benefit nor access to Salton Sea Renewables
<p>SONGS Light/Heavy Transmission</p>	<ul style="list-style-type: none"> • Upgrades of Barre-Ellis line is required and not possible • No meaningful impact on import capability into San Diego, hence no economic benefit expected/studied

Alternatives Studies by SDG&E and Reviewed by CAISO

- **21 scenarios and alternatives were reviewed by project sponsors (mainly SDG&E)**
- **CAISO reviewed SDG&E's study of alternatives and confirms them**
 - These scenarios and alternatives are presented in the CAISO full report
- **The review helped the CAISO firm up the base plan of service for reliability and economic analyses**

RPS Assessment for Sun Path Project

- **Meeting the state RPS goal (along with meeting the San Diego reliability needs) requires that the in-service date of the Sun Path project to be no later than 2010**
 - Sun Path project provides the needed access to renewable energy resources in Salton Sea area without hindering economic imports into the CAISO system
 - Without Sun Path, development of renewable energy resources in Imperial Valley area is expected to be limited as California utilities will not want their economy imports to be potentially curtailed by developing renewable resources
- **Similar argument can probably be made for the LEAPS and Tehachapi projects – we will bring such discussions forward at the time we will present our findings on those projects**

Sun Path Project Recommendations

Recommendation on the Sun Path Project

- **Based on the results presented here we intend to recommend the Board to approve the Sun Path project as it:**
 - Provides positive net economic value for the CAISO ratepayers;
 - Solves San Diego's known reliability problems for 2010 and beyond; and
 - Enables SDG&E and other California utilities to more readily comply with the state's mandated RPS requirement without curbing economic imports to California

Concluding Remarks

- *We have developed our findings and recommendations based on a set of credible, reasonable and verifiable data and assumptions on system configuration, loads and resources, and fuel prices; and*
- *The results of our assessment, whether economic or reliability based, could be used to determine whether non-transmission alternatives, including generation or demand-side alternatives, could be considered as replacement to the recommended transmission project.*