CALIFORNIA ISO

California Independent System Operator

California ISO

Supplement to the Transmission Economic Assessment Methodology Report

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1 Introduction

On June 3, 2004, the California CAISO filed its Transmission Economic Assessment Methodology (TEAM) report with the California Public Utilities Commission (CPUC) in docket no. I.00-11-001. The TEAM report presented a methodology, including evaluation principles, model requirements, and a recommended analytical approach, for evaluating the economic viability of transmission upgrades and applied that methodology to a potential enhancement to Path 26. The primary purpose of the TEAM report was to describe a durable set of essential methodological components and demonstrate those components. The actual results are of secondary importance, except to the extent they must be evaluated as representing a useful data set for decision-makers. This Supplement was produced to correct some arithmetic calculations in the filing that required updating all runs in a consistent manner, and clarification of several potential ambiguities in order to increase the transparency and uniformity of our presentation. This Supplement does not materially affect the methodological components, evaluation principles, model requirements, or the conclusions reached in the TEAM Report. Specifically, the Supplement provides comprehensive updated results based on the following modifications described below:

- Revisions to the California CAISO Participant Benefit calculation to properly deduct monopoly rents from the competitive rent calculation
- Revisions to the utility and non-utility net revenue calculation
- Clarification of certain statements to avoid potential misunderstandings
- Update of allocation of transmission owner benefit for the Pacific DC Intertie, and
- Inclusion of additional cases for a more robust analysis, especially for year 2008.

2 Solution Data Revisions

2.1 Deducting Monopoly Rent in Competitive Rent Calculation

Chapter 2 of the TEAM Report filed June 3, 2004 discusses the composition of a strategic supplier's producer surplus: competitive rent and monopoly rent. The PLEXOS™ solution database does not report generators' competitive rent directly, thus post-processing is required to compute competitive rent. Competitive rent is the difference between Net Revenue and Monopoly Rent.

Chapter 9 of the TEAM Report reported case results that inadvertently combined monopoly and competitive rents. When the California CAISO Participant Benefit was reported in Tables 9.3, 9.4, 9.5, 9.6 and 9.11, the intention was to present benefits reflective of changes in competitive rent. However, in several cases the computed results for this benefit included both competitive rent and monopoly rent. All of these cases modeled the year 2008. In Table 9.4, two cases were affected:

Case #1: Base load, VL gas price, Base hydro and Moderate markup (fourth case in the table)
Case #2: Base load, VH gas price, Base hydro and Moderate markup (sixth case in the table)

In Table 9.5, two more cases were affected:

Case #3: VL load, Base gas price, Base hydro and Moderate markup (first case in the table)
Case #4: VH load, Base gas price, Base hydro and Moderate markup (third case in the table)

For each of these cases, the CAISO Participant Benefit was recomputed to include only competitive rent, as shown in Table 2-1.[1] The adjusted results are also available in the Appendix that summarizes the different benefits for all cases.

Table 2-1 Adjustments to CAISO Participant Benefits for Competitive Rent Only Correction

Case #	CAISO Participant Benefit presented in TEAM Report	Adjusted CAISO Participant Benefit
1	$6.15 mil.	$3.15 mil.
2	$25.68 mil.	$31.33 mil.
3	$9.48 mil.	$14.03 mil.
4	$17.50 mil.	$20.70 mil.

2.2 Utility and Non-Utility Net Revenue Calculation

Generation resources in the three CAISO regions (PG&E region, SCE region, and SDG&E region) are classified as either utility-retained generation or IPP-generation for purpose of implementing market price modeling. Utility-retained generation is the generation owned directly by the three utilities and is considered to bid competitively in the CAISO wholesale market since it is owned by utilities, which are net buyers in the market. Condition 2 RMR units are also classified as utility-retained generation and are assumed to be competitive. IPP generation resources not under RMR condition 2 contracts are treated as non-utility generation. If strategic suppliers own these IPP resources, the resources are modeled as strategic resources.

[1] A few of the other modifications discussed in this supplement have also affected the values of the CAISO Participant Benefit for these cases.

The State of California, on behalf of three utilities, signed long-term purchase contracts with mostly IPP generations during the California energy crisis. Some of these contracts extend to year 2008 and beyond. If a strategic supplier signed a long-term contract with the State, this portion of the capacity is treated as non-strategic. A supplier's contract position affects its net revenue and a utility's total contract affects the net short position to meet its load. Thus, it is important that the calculation of consumer surplus and producer surplus (i.e., generation net revenue) reflects the impact of these contracts.

In PLEXOS™ solution database, producers' surplus (i.e., generation net revenue) is reported in three categories: the regional total generation net revenue, the regional total utility net revenue, and the regional total non-utility net revenue. In general, the Generation Net Revenue should equal the sum of the Utility Net Revenue and the Non-utility Net Revenue. After filing the TEAM report with the CPUC on June 3, 2004, it was discovered that this relationship did not hold. Further investigation revealed that Generation Net Revenue was computed after netting out the contracts; Utility Net Revenue and Non-utility Net Revenue were not. Furthermore, a review of input data revealed an incorrect allocation of contract share.

These issues were corrected in PLEXOS™ and the input database, changing the Path 26 results in an insignificant way as shown in the "Results" section below. It should be noted that in making this correction to PLEXOS™, a new version of the model was issued.[2] The new version of PLEXOS™ was used to prepare this Supplement and to rerun all cases set forth in the appendix. It should be noted that, while the manner in which PLEXOS treats contracts is not prescribed, any model employed by a project proponent should take into account the effects of contracts whether or not full information on such contracts is available. If full information is not available, the model can incorporate some reasonable assumptions or, alternatively, scenarios analysis can be used.

[2] The original results filed on June 3rd were produced using PLEXOS version 4.638R1 and the new results filed in this Supplement were produced using PLEXOS version 4.645R2.

3 Clarifications

This section of the Supplement addresses statements in the TEAM report that require clarification to avoid potential misunderstandings as to their intended meaning.

3.1 Sensitivity Case Selection – New Economic Generation Entry

The discussion of new economic generation entry in Chapter 5 at page 5-7 of the TEAM Report discusses how economic entry of generation resources was developed. This discussion briefly mentioned the development of under- and over-entry scenarios. Although the development of under- and over-entry scenarios was incorporated into the report for contingency sensitivities, neither this fact nor the discussion of how it was accomplished is relevant to the topic of economic new entry. Over- and under-entry scenarios are more appropriately linked to discussions of reserve margin new entry – in other words, new entry that focuses on meeting capacity requirements used in the study is as described in section 8.3.4 of the TEAM Report.

3.2 Other Capacity Resources

The TEAM Report described in detail the capacity additions included in the study for the purpose of maintaining reserve margin. However, the list of approved or likely projects varies in length from one region to another. It is not reasonable to suppose that regions for which less information is known will experience capacity shortfalls in 2008 and 2013. For this reason, in all regions outside of California, additional, generic capacity resources are included in the model.

Additional capacity assumed 15,000 MMBTU/MWh rate and $14/MWh of VOM cost resulting in a price of greater than or equal to $75/MWh similar to a peaker's marginal cost. This price is substantially higher than the price of any other resource in each area. This pricing is designed to incorporate the following:

- Addition of peaking capacity,
- Operational techniques for avoiding contingencies (since this capacity should be highest-priced in the supply curve),
- Valuing possible loss of load during peak periods.

3.3 Hydro Scenario Water Years[3]

The discussion of Hydro Sensitivities in Section 8.6 of the TEAM Report described the derivation of Hydro scenarios. The report stated, "the high hydro case is the year 1948 water condition, and the low hydro case is the year 1930 water condition."[4] These water years were used for hydro projects in the Pacific Northwest. The water conditions for California in same years were not readily available. For this reason, the CEC 20-year hydro database (1980-2000) was used as a data source. Average water was a monthly average of hydro energy for all years. The low case

[3] Thanks to Kurt Granat from PacifiCorp who prepared the data for SSGWI efforts for providing a more detailed description of the origin of the hydro cases.
[4] TEAM Report, pg. 8-27

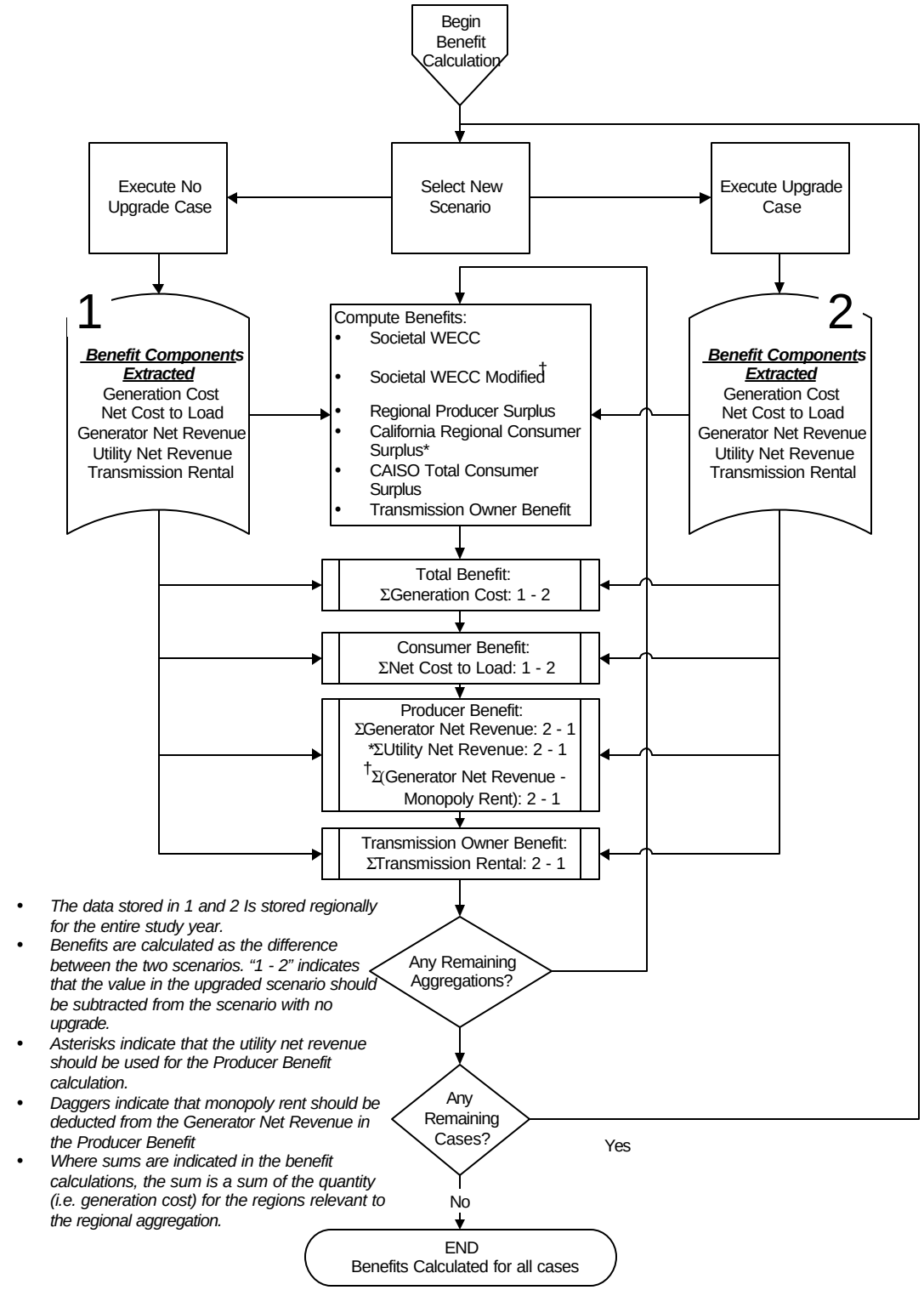
averaged the lowest 4-5 years of hydro energy. The high case averaged the highest 4-5 years of hydro energy.

No data was submitted for the Rocky Mountain or Southwest regions. Furthermore, water storage in the Southwest is much longer term than in the Pacific Northwest. Thus, these regions' hydro profiles remained constant throughout the three scenarios. Hydro constitutes a small portion of total energy in these regions. These two factors make constant hydro in these regions for the three hydro scenarios a reasonable assumption.

3.4 Benefit Calculation Flow Diagram

The TEAM Report discusses the calculation of several different categories of benefits for the purpose of economic evaluation of transmission projects. Several different types of benefits are computed. Furthermore, the names of the output data in PLEXOS™ are not obviously related to the various types of benefits. The following flow diagram demonstrates the process of benefit computation, and clarifies the differences between types of data and the names of PLEXOS™ data points associated with each benefit type.

Figure 3-1 Benefit Calculation Flow Diagram



- *The data stored in 1 and 2 Is stored regionally for the entire study year.*
- *Benefits are calculated as the difference between the two scenarios. "1 - 2" indicates that the value in the upgraded scenario should be subtracted from the scenario with no upgrade.*
- *Asterisks indicate that the utility net revenue should be used for the Producer Benefit calculation.*
- *Daggers indicate that monopoly rent should be deducted from the Generator Net Revenue in the Producer Benefit*
- *Where sums are indicated in the benefit calculations, the sum is a sum of the quantity (i.e. generation cost) for the regions relevant to the regional aggregation.*

3.5 Market Pricing Implementation Calibration and Revisions

The TEAM Report describes a statistical relationship between price-cost markups and system conditions in Section 4. This relationship was applied prospectively to year 2008 and 2013 to predict bid-cost markups. This approach requires some calibration to ensure that the predicted price-cost markup is reflected in the bidding strategy that is developed.

Prior to June 3, 2004, this calibration was developed implicitly, because no explicit calibration factor was available in the PLEXOS™ engine. Since June 3, 2004, the capability to explicitly calibrate this relationship was added to PLEXOS. This revision improves the transparency in the markup determination process, and has no effect on the final markup.

4 Pacific DC Intertie Transmission Owner Benefit Allocation

4.1 Update to PDCI Transmission Owner Benefit Allocation

Any attempt to allocate transmission owner benefit will not affect the total economic benefit (i.e., total societal benefit or modified societal benefit) for the entire WECC. However, allocation could lead to different benefits to various regions within the WECC. After further investigation of the results, we believe it is appropriate to re-allocate Pacific DC Intertie (PDCI) transmission owner benefit to more accurately reflect the economic benefits to different regions, especially to the California ratepayers and market participants. Also, given the complex structure underneath the PDCI lines, we recommend implementing this *ex post* reallocation when evaluating other major transmission projects that affect the CAISO. Of course, the importance of, or need to perform, this allocation might vary significantly depending on the location and significance of the line, and therefore is subject to discretion of the project proponent.

Transmission owner benefit for a transmission line is typically allocated to the regions the line connects. For lines that are entirely within a single region, the transmission owner benefit is allocated entirely to that region. This was true of the PDCI in the study results presented in the TEAM Report. This allocation is not appropriate for the PDCI. Although the PDCI spans the NORTHWEST region and the LADWP region, participants in the CAISO control area own the majority of the transmission rights. The ownership of the PDCI could not be directly implemented in the model without changing the method of modeling transmission owner benefit allocation for the whole WECC. Furthermore, subtleties of the network model allow transmission owners to accrue benefits on AC lines that loop on either terminus of the two DC lines that comprise the PDCI.[5] The transmission owner benefit throughout the loop stays approximately constant between cases, but the benefit at the regional location can shift, leading to inappropriate regional allocation of benefits between the NORTHWEST, LADWP and SOCALIF. The TEAM report was filed before these complications were resolved. Thus the results presented in the TEAM report do not accurately allocate PDCI transmission owner benefit between the regions it affects.

Since the filing of the TEAM report, a strategy has been developed to allocate the transmission owner benefits to regions appropriately. This strategy requires line-by-line accounting of transmission rental for each segment of the loop joining the PDCI on either end. The correct allocations of transmission rental for this group of lines are shown in Table 4-1. It is worthwhile to note that this allocation holds for all of the specified lines, whether they are wholly within one region or not. There are differences between the N→S and S→N transmission rights, but these differences are small enough to be ignored for the purposes of this study.

In the TEAM report, transmission owner benefits for each region were simply computed to be the difference in total transmission rental for the region between the “with upgrade” and “without upgrade” cases. This modification requires the transmission rental for the PDCI to be re-allocated

[5] In PLEXOS™ a DC line is modeled as equal and opposite injections. The optimization in the PLEXOS™ program is to minimize total dispatch cost to relieve the AC network congestion. Because of this modeling approach, congestion revenues on the DC lines can be easily shifted to its interconnected AC lines in a loop.

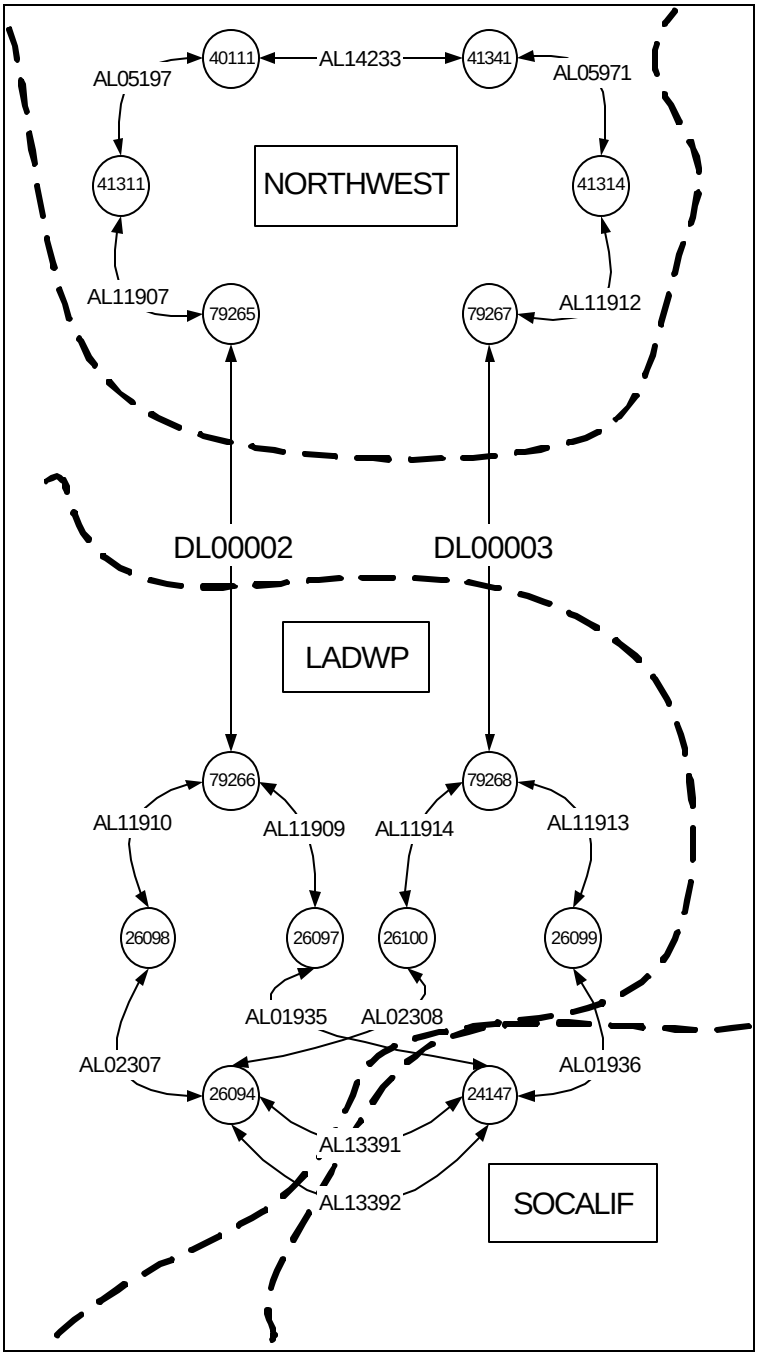
to the affected regions prior to computing the transmission owner benefits. A working example of this computation is provided below.

Table 4-1 Allocation of PDCI Transmission Rental

Region	% of CAISO Allocation	% of Total Allocation
NORTHWEST	-	0%
LADWP	-	31%
CAISO	100%	69%
SOCALIF	58.7%	40.5%
PG AND E	35.7%	24.6%
SANDIEGO	5.6%	3.9%

Figure 4-1 diagrams the 17 lines that comprise the loop. Each line is labeled with its name in the PLEXOS™ database. Each bus is numbered to match the PLEXOS™ database as well. The dashed lines show regional boundaries.

Figure 4-1 Diagram of Network Topology surrounding the PDCI



A Table is provided in Appendix B as the key to the node numbers.

EXAMPLE: Suppose each of the five regions (NORTHWEST, LADWP, SOCALIF, PG AND E and SANDIEGO) accrued $2000 of transmission rental in the “no upgrade” case and $1000 of transmission rental in the “with upgrade” case. Without reallocating the PDCI transmission rental, each region has a transmission owner benefit of -$1000. Suppose that the line DL00002 (one of the two DC lines) accrues $200 of transmission rental in the “no upgrade” case and $100 of transmission rental in the “with upgrade” case. Since DL00002 connects the NORTHWEST and LADWP regions, the current regional transmission rentals for those regions ($2000 “no upgrade” and $1000 “with upgrade”) already include 50% for each region of the transmission rental on

DL00002. The NORTHWEST region does not have any rights to that transmission rental and the LADWP region's rights are about 31% instead of 50%. Thus, the transmission rental that this line accrues to these regions is deducted from these regions' totals. Then the transmission rental from this line is divided based on the share of PDCI ownership from Table 4-1 and added into the transmission rental for the affected regions. In this way, transmission rental for the DL00002 line is moved from the old allocation to the new allocation.

The following table works through this example. The Benefit section at the bottom of the table shows that the reallocation shifts transmission rental losses that were incorrectly assigned to the NORTHWEST and LADWP regions are allocated to the owners of the transmission rights on the PDCI. The benefit data is always the difference in the value between the "With Upgrade" case and the "No Upgrade" case.

Table 4-2 Example of PDCI Transmission Rental Reallocation

			Total	NORTHWEST	LADWP	SOCALIF	PG AND E	SANDIEGO
No Upgrade	Regional Transmission Rental		$10,000	$2,000	$2,000	$2,000	$2,000	$2,000
	DL00002 Transmission Rental	-	$200	$100	$100	$0	$0	$0
	DL00002 Reallocation	+	$200	$0	$62	$81	$49.20	$7.80
	Regional Reallocation		$10,000	$1,900	$1,962	$2,081	$2,049	$2,008
			Total	NORTHWEST	LADWP	SOCALIF	PG AND E	SANDIEGO
With Upgrade	Regional Transmission Rental		$5,000	$1,000	$1,000	$1,000	$1,000	$1,000
	DL00002 Transmission Rental	-	$100	$50	$50	0	$0	$0
	DL00002 Reallocation	+	$100	0	31	40.5	24.6	3.9
	Regional Reallocation		$5,000	$950	$981	$1,041	$1,025	$1,004
			Total	NORTHWEST	LADWP	SOCALIF	PG AND E	SANDIEGO
Benefit	Regional Transmission Rental		($5,000)	($1,000)	($1,000)	($1,000)	($1,000)	($1,000)
	DL00002 Transmission Rental	-	($100)	($50)	($50)	$0	$0	$0
	DL00002 Reallocation	+	($100)	$0	($31)	($41)	($25)	($4)
	Regional Reallocation		($5,000)	($950)	($981)	($1,041)	($1,025)	($1,004)

This computation must be performed for every line in the PDCI reallocation diagram (Figure 4-1). Table 4-3 only shows the computation for one of the 17 lines that are considered.

4.2 Additional Scenarios for Expected Benefit Calculation

Additional scenarios may enhance the robustness of the TEAM report, and any report. The CAISO has run additional scenarios, especially with respect to test-year 2008,and their results are added to the study through this Supplement. [6] Table lists all required scenarios and their corresponding probabilities that are used for the expected value computation. This table also indicates with an "X" those scenarios originally included in the results presented in the TEAM report. Detailed benefit results for all cases are included in the Appendix.

[6] Given relatively lower uncertainty with respect to year 2008 and the time constraint in filing the TEAM report, fewer scenarios were analyzed for 2008. In this Supplement, we add more cases for 2008 so that the case scenarios are consistent between year 2008 and 2013, and one set of probability can be adopted for both years.

Table 4-3 Scenarios Required for Expected Value Computation[7]

Market Based						
Demand	**Gas Price**	**Hydro**	**Markup[8]**	**Probability**	**2008**	**2013**
VH	B	B	H	0.0228		X
B	VH	B	H	0.0228		X
B	B	B	H	0.0937	X	X
B	VL	B	H	0.0228		X
VL	B	B	H	0.0228		X
VH	VH	B	M	0.0228		X
VH	B	B	M	0.0937	X	X
VH	VL	B	M	0.0228		X
B	VH	B	M	0.0937	X	X
B	B	B	M	0.1646	X	X
B	VL	B	M	0.0937	X	X
VL	VH	B	M	0.0228		X
VL	B	B	M	0.0937	X	X
VL	VL	B	M	0.0228		X
VH	B	B	L	0.0228	X	X
B	VH	B	L	0.0228	X	X
B	B	B	L	0.0937	X	
B	VL	B	L	0.0228	X	X
VL	B	B	L	0.0228	X	X

Table 4-4 below lists scenarios related to cost-based expected value calculation. The probabilities of joint demand/gas price/hydro event (without markup) were developed similarly using the Moment Consistent LP approach and were reported in our February 28 CPUC filing. Several such cost-based cases were not conducted when the TEAM report was filed due to time constraints. In this Supplement, additional cases are provided to enhance the calculation of the expected Path 26 upgrade benefit.

Table 4-4 Scenarios Required for Cost-Based Expected Value Computation

Cost Based						
Demand	**Gas Price**	**Hydro**	**Markup**	**Probability**	**2008**	**2013**
VH	VH	B	N	0.0121		
VH	B	B	N	0.1606	X	X
VH	VL	B	N	0.0121		
B	VH	B	N	0.1606	X	X
B	B	B	N	0.3092	X	X
B	VL	B	N	0.1607	X	X
VL	VH	B	N	0.0121		
VL	B	B	N	0.1606	X	X
VL	VL	B	N	0.0121		

[7] VH = Very High, B = Base, H = High, VL = Very Low, L = Low, N = None, M = Moderate. High and low are corresponding boundary-points in a 75% confidence interval. Very high and very low are boundary points in a 90% confidence interval.

[8] In the case of Bid-Cost Markup, Moderate (M) corresponds to the expected value of bid-cost markup, similar to Base case (B) for gas price or demand.

By including these additional scenarios, the expected Path 26 upgrade benefit for both cost-based and market-based is updated. No additional scenarios are conducted for contingency study and sensitivities in hydro and new entry.

5 Results

After implementing the revisions and updates discussed above, the entire battery of cases was repeated. This Results section reports the updated Path 26 study results. For the readers' convenience, this Results section follows the structure of Chapter 9 of the TEAM report.

5.1 Benefits for Cost-Based and Market-Based Reference Cases

The reference cases continue to use the assumptions of base demand, bas gas price, base hydro, and base economic new generation entry.

5.1.1 Reference Case: 2008 Cost-Based and Market-Based

Table 5.1 below shows cost-based benefit results for the 2008 reference case. The total societal benefit and modified societal benefit change slightly from what was reported in the TEAM report. However, the revisions and updates discussed in this Supplement only affect the benefit distribution among various market participants or across various geographic regions for cost-based simulation. The cost-based simulation shows that Path 26 upgrade is beneficial to WECC in 2008, but is not beneficial to California SO ratepayers or California SO market participants.

Table 5.1 2008 Reference Case – Cost Based (Annual Benefits)[9]

Perspective	Description	Consumer Benefit ($ M)	Producer Benefit ($ M)	Transmission Owner Benefit ($ M)	Total Benefit[10] ($ M)
Societal	WECC	6.32	1.27	(6.61)	0.99
Modified Societal	WECC	6.32	1.27	(6.61)	0.99
California Competitive Rent	CAISO Ratepayer Subtotal	(0.29)	2.05	(3.30)	(1.54)
	CAISO Participant Subtotal	(0.29)	3.38	(3.30)	(0.21)

Moderate bid-cost markups were applied in the reference market-based case. Table 5.2 presents the correct market-based results for 2008 reference case. Total benefits in various perspectives do deviate from the original results filed. Again, the non-material difference is caused by the changes reflected in the Supplement.

[9] See Table 9.1 from the TEAM Report

[10] The total benefit of transmission upgrade equals the total production cost saving due to upgrade assuming inelastic demand.

Table 5.2 2008 Reference Case – Market Based (Annual Benefits)[11]

Perspective	Description	Consumer Benefit ($ M)	Producer Benefit ($ M)	Transmission Owner Benefit ($ M)	Total Benefit[12] ($ M)
Societal	WECC	62.45	(40.21)	(17.68)	4.55
Modified Societal	WECC	62.45	(35.14)	(17.68)	9.62
California Competitive Rent	CAISO Ratepayer Subtotal	16.93	(2.24)	(7.17)	7.53
	CAISO Participant Subtotal	16.93	7.00	(7.17)	16.77

5.1.2 Reference Case: 2013 Cost-Based and Market-Based

The 2013 market based results were not included in Chapter 9 of the TEAM report, but instead were reported in the Executive Summary. The following two tables show the correct results for both cost based and market based 2013 reference case.

Table 5.3 2013 Reference Case – Cost Based (Annual Benefits)[13]

Perspective	Description	Consumer Benefit ($ M)	Producer Benefit ($ M)	Transmission Owner Benefit ($ M)	Total Benefit ($ M)
Societal	WECC	1.56	0.96	(2.07)	0.46
Modified Societal	WECC	1.56	0.96	(2.07)	0.46
California Competitive Rent	CAISO Ratepayer Subtotal	(0.80)	0.98	(0.81)	(0.63)
	CAISO Participant Subtotal	(0.80)	1.63	(0.81)	0.02

[11] See Table 9.2 from the TEAM Report

[12] The total benefit of transmission upgrade equals the total production cost saving due to upgrade assuming inelastic demand.

[13] Not included in the TEAM Report

Table 5.4 2013 Reference Case – Market Based (Annual Benefits)[14]

Perspective	Description	Consumer Benefit ($ M)	Producer Benefit ($ M)	Transmission Owner Benefit ($ M)	Total Benefit[15] ($ M)
Societal	WECC	34.38	(25.76)	(6.59)	2.02
Modified Societal	WECC	34.38	(16.92)	(6.59)	10.87
California Competitive Rent	CAISO Ratepayer Subtotal	11.05	(3.98)	(0.87)	6.20
	CAISO Participant Subtotal	11.05	4.59	(0.87)	14.77

The total benefits do not deviate significantly from what were originally filed, but distributions of total benefits do change to reflect all revisions and updates conducted for the Supplement.

5.2 Effects of Gas Prices, Demand, and Hydro on Benefits

In this section, corrected results are presented related to the impacts of major variables – gas price, demand and hydrology – on Path 26 upgrade benefits.

5.2.1 Effects of Gas Prices on Path 26 Upgrade Benefits

Gas price has significant impact on total benefit, and higher gas price most likely will lead to higher total benefit of Path 26 upgrade.

Table 5.5 Effects of Gas Prices on Benefits - Year 2008 & Year 2013[16]

Year	Load	Gas Price	Hydro	Market Pricing	Other	Societal Benefits ($ M)	Modified Societal Benefits ($ M)	CAISO Participant Benefit ($ M)	CAISO Ratepayers Benefits ($ M)
2008	Base	VL	Base	Low	None	$ 0.41	$ (0.27)	$ (1.10)	$ (1.46)
2008	Base	Base	Base	Low	None	$ 1.32	$ 2.12	$ 1.91	$ (0.35)
2008	Base	VH	Base	Low	None	$ 1.50	$ (2.34)	$ (2.98)	$ (2.01)
2008	Base	VL	Base	Moderate	None	$ 1.59	$ (0.65)	$ 1.82	$ 0.91
2008	Base	Base	Base	Moderate	None	$ 4.55	$ 9.62	$ 16.77	$ 7.53
2008	Base	VH	Base	Moderate	None	$ 6.95	$ 10.05	$ 21.47	$ 11.53
2013	Base	VL	Base	Low	None	$ 0.03	$ (1.26)	$ (1.37)	$ (0.45)
2013	Base	Base	Base	Low	None	$ 0.39	$ (0.02)	$ 0.03	$ (0.39)
2013	Base	VH	Base	Low	None	$ 0.90	$ (1.04)	$ (1.69)	$ (1.82)

[14] See Table ES.5 from the TEAM Report

[15] The total benefit of transmission upgrade equals the total production cost saving due to upgrade assuming inelastic demand.

[16] See Table 9.4 from the TEAM Report

Year	Load	Gas Price	Hydro	Market Pricing	Other	Societal Benefits ($ M)	Modified Societal Benefits ($ M)	CAISO Participant Benefit ($ M)	CAISO Ratepayers Benefits ($ M)
2013	Base	VL	Base	Moderate	None	$ 0.72	$ 1.85	$ 3.60	$ 2.14
2013	Base	Base	Base	Moderate	None	$ 2.02	$ 10.87	$ 14.77	$ 6.20
2013	Base	VH	Base	Moderate	None	$ 3.48	$ 21.58	$ 27.83	$ 10.07

5.2.2 Impact of Demand on Path 26 Upgrade Benefits

Table 5.6 shows the impact of various demand levels on Path 26 upgrade benefit. Again the conclusion is that Path 26 upgrade would be more valuable when demand increased.

Table 5.6 Effects of Demand on Benefits - Year 2008 & Year 2013[17]

Year	Load	Gas Price	Hydro	Market Pricing	Other	Societal Benefits ($ M)	Modified Societal Benefits ($ M)	CAISO Participant Benefit ($ M)	CAISO Ratepayers Benefits ($ M)
2008	VL	Base	Base	Moderate	None	$ 2.17	$ 6.03	$ 9.88	$ 2.68
2008	Base	Base	Base	Moderate	None	$ 4.55	$ 9.62	$ 16.77	$ 7.53
2008	VH	Base	Base	Moderate	None	$ 8.56	$ 13.47	$ 22.31	$ 10.88
2013	VL	Base	Base	Moderate	None	$ 0.92	$ 3.10	$ 4.65	$ 0.79
2013	Base	Base	Base	Moderate	None	$ 2.02	$ 10.87	$ 14.77	$ 6.20
2013	VH	Base	Base	Moderate	None	$ 4.63	$ 16.09	$ 19.39	$ 13.02
2013	VL	Base	Base	High	None	$ 1.02	$ 7.59	$ 9.56	$ 1.96
2013	Base	Base	Base	High	None	$ 1.73	$ 10.02	$ 13.03	$ 5.04
2013	VH	Base	Base	High	None	$ 6.34	$ 22.81	$ 27.54	$ 17.21

5.2.3 Impact of Hydro Availability on Path 26 Upgrade Benefits

Table 5.7 presents the impact of hydro availability on Path 26 upgrade benefit. Again the benefit of upgrade was significantly larger in the wet hydro condition than base or dry hydro condition.

Table 5.7 Effects of Hydro Conditions on Benefits – 2008 & 2013[18]

Year	Load	Gas Price	Hydro	Market Pricing	Other	Societal Benefits ($ M)	Modified Societal Benefits ($ M)	CAISO Participant Benefit ($ M)	CAISO Ratepayers Benefits ($ M)
2008	Base	Base	Dry	None	None	$ 1.53	$ 1.53	$ (0.20)	$ 1.03
2008	Base	Base	Base	None	None	$ 0.99	$ 0.99	$ (0.21)	$ (1.54)
2008	Base	Base	Wet	None	None	$ 4.79	$ 4.79	$ (2.62)	$ 2.62
2013	Base	Base	Dry	Moderate[19]	None	$ 3.72	$ 17.82	$ 17.50	$ 12.02
2013	Base	Base	Base	Moderate	None	$ 0.46	$ 0.46	$ 0.02	$ (0.63)

[17] See Table 9.5 from the TEAM Report

[18] See Table 9.6 from the TEAM Report

[19] The original analysis filed on June 3 for hydro's impact on Path 26 upgrade benefits in 2013 held markup at low level while here we hold markup at moderate level.

Year	Load	Gas Price	Hydro	Market Pricing	Other	Societal Benefits ($ M)	Modified Societal Benefits ($ M)	CAISO Participant Benefit ($ M)	CAISO Ratepayers Benefits ($ M)
2013	Base	Base	Wet	Moderate	None	$ 4.46	$ 11.39	$ 14.58	$ 2.31
2013	VH	VH	Dry	Moderate	None	$ 11.98	$ 29.65	$ 29.32	$ 35.50
2013	VH	VH	Wet	Moderate	None	$ 11.24	$ 23.98	$ 35.10	$ 19.87

5.3 Impact of Wind Resource Location on Path 26 Upgrade Benefits

In all the cases, it was assumed that Kern County new wind resources would be connected with SCE's transmission system, i.e., to the south end of path 26. An alternative is to connect Kern County wind with PG&E's system, i.e., to the north end of Path 26. Table 5.8 below shows the comparison of these two alternatives, holding demand and gas price at bases, and markup at moderate level.[20] Again the results show very small impact of Kern County wind connection on Path 26 upgrade benefits.

Table 5.8 Effect of Kern County Wind Connection on Benefit (2013)[21]

	Connected with SCE System	Connected with PG&E System
Total Societal Benefit	$2.02 M	$1.93 M
Total Modified Societal Benefit	$10.87 M	$10.40 M
CAISO Participant Benefit	$14.77 M	$ 14.61 M
CAISO Ratepayer Benefit	$6.20 M	$6.89 M

5.4 Expected Benefit from Path 26 Upgrade

For the scenarios included in this Supplement, the following tables report the expected values for both market-based and cost-based cases. Market-based expected benefits of Path 26 upgrade are shown in Table 5.9.

Table 5.9 Expected Benefit of Path 26 Upgrade – Market Based ($M)[22]

	Total Societal Benefit	Total Modified Societal Benefit	Total CAISO Participants Benefit	Total CAISO Ratepayers Benefit
2008	$4.39 M	$7.67 M	$13.47 M	$5.89 M
2013	$2.12 M	$9.33 M	$12.05 M	$5.47 M

The expected benefits from market based simulation are significantly higher than the cost based simulation, which are shown in Table 5.10.

[20] The original comparison filed on June 3 holds demand and gas price at bases and makeup at low level.
[21] See Table 9.7 from the TEAM Report
[22] See Table 9.8 from the TEAM Report

Table 5.10 Expected Benefit of Path 26 Upgrade – Cost Based ($M)[23]

	Total Societal Benefit	Total Modified Societal Benefit	Total CAISO Participants Benefit	Total CAISO Ratepayers Benefit
2008	$0.95 M	$0.95 M	$(0.38) M	$(1.39) M
2013	$0.66 M	$0.66 M	$0.05 M	$(0.21) M

5.5 Most Likely Range of Path 26 Upgrade Benefits

Table 5.11 shows the most likely ranges of Path 26 upgrade benefits. These ranges are derived using the Max/Min linear programming technique discussed in Chapter 5 of the TEAM report. The changes in results between those reported in Table 5.11 and those included in the TEAM report, while insignificant, are mostly due to a larger set of cases included in the Supplement's "most likely range calculation".

Table 5.11 Most Likely Benefit Range of Path 26 Upgrade in 2013[24]

	Lower Bound	Upper Bound
Total Societal Benefit	$1.89 M	$3.08 M
Total Modified Societal Benefit	$8.46 M	$13.78 M
Total CAISO Participants Benefit	$11.03 M	$17.70 M
Total CAISO Ratepayers Benefit	$4.78 M	$8.61 M

5.6 Benefits Under Contingency Situations

Table 5.12 compares the benefit of Path 26 upgrade under three outage scenarios: no outage, PDCI outage, and SONGS outage, while holding all other conditions constant. Again contingencies such as PDCI outage or SONGS outage can lead to significant higher benefit to Path 26 upgrade than without these contingencies. Note that we held markup at moderate level rather than the low markup level in the original TEAM report. We choose to do so because contingency situations could significantly increase the possibility of some suppliers exercising market power. Therefore, to fully capture the benefits of this upgrade in contingency situations, it is more appropriate to use some moderate level of price-cost markups rather than the low ones.

Table 5.12 Effects of Contingency Events on Path 26 Upgrade Benefit[25]

Year	Load	Gas Price	Hydro	Market Pricing	Outage	Societal Benefits ($ mil.)	Modified Societal Benefits ($ mil.)	CAISO Participant Benefit * ($ mil.)	CAISO Ratepayers Benefits * ($ mil.)
2008	Base	Base	Base	Moderate	None	$ 4.55	$ 9.62	$ 16.77	$ 7.53

[23] See Table 9.9 from the TEAM Report
[24] See Table 9.10 from the TEAM Report
[25] See Table 9.11 from the TEAM Report

2008	Base	Base	Base	Moderate	PDCI	$ 7.48	$ 19.50	$ 29.22	$ 14.51
2008	Base	Base	Base	Moderate	SONGS	$ 6.99	$ 8.08	$ 19.76	$ 11.64
2013	Base	Base	Base	Moderate	None	$ 2.02	$ 10.87	$ 14.77	$ 6.20
2013	Base	Base	Base	Moderate	PDCI	$ 4.65	$ 23.07	$ 31.55	$ 14.69
2013	Base	Base	Base	Moderate	SONGS	$ 2.69	$ 14.42	$ 21.26	$ 9.05
2013	VH	VH	Base	Moderate	None	$ 9.84	$ 41.43	$ 49.71	$ 29.38
2013	VH	VH	Base	Moderate	PDCI	$ 14.94	$ 60.97	$ 73.02	$ 36.57
2013	VH	VH	Base	Moderate	SONGS	$ 8.80	$ 21.87	$ 33.24	$ 18.88

5.7 Summary

After incorporating the revisions and updates described in the Supplement, all of the cases in the study were re-estimated. Also, as noted above, some new cases were added in the study for this Supplement. The resulting changes in study results, however, do not change the conclusions of the original study.

The expected benefits for 2008 were greater than those presented in the TEAM Report for all categories except for the CAISO Ratepayer Benefit. These differences were mainly caused by the inclusion of several cases most of which employed high or moderate bid-cost markups. These new cases increase the expected benefit of the upgrade.

The results for the 2013 expected benefit were very similar to those presented in the TEAM Report. The only notable difference was the 22% increase in Modified Societal Benefit. The increase in Modified Societal Benefit without a simultaneous increase in CAISO Participant Benefit implies that price-cost markup originating in CAISO was more effectively relieved by resources outside the CAISO in the revised study than in the original study. The reallocation of transmission rental on the PDCI (§4.1) and the deduction of monopoly rent in California ratepayer benefit and California market participant benefit calculation (§2.1) had the greatest impact on benefits for individual cases. These changes primarily impacted the CAISO Participant Benefit and the CAISO Ratepayer Benefit. However, these two changes acted in opposition to each other. The reallocation of transmission rental acted to decrease the CAISO Participant and Ratepayer Benefits, because the loss of transmission rental on the PDCI shifted from non-CAISO regions (NORTHWEST and LADWP) to CAISO regions, while deducting a loss of monopoly rent in CAISO regions acted to increase the same benefits. The net result of these two effects was small.

The modifications and clarifications described in this Supplement to the TEAM Report do not substantially affect the original conclusions. However, the revisions and updates implemented in the Supplement improve the clarity of the methodology and reinforce the original findings.

6 Appendix A

	Year	Load	Gas Price	Hydro	Market Pricing	Other	Joint Probability	Total Cost Without ($ mil.)	Total Cost With ($ mil.)	Societal Benefits ($ mil.)	Modified Societal Benefits ($ mil.)	CAISO Ratepayer Benefit ($ mil.)	CAISO Participant Benefit ($ mil.)	Consumer Benefit ($ mil.)	Producer Benefit ($ mil.)	Transmission Owner Benefit ($ mil.)
1	2008	B	B	B	N	N		$ 17,040.42	$ 17,039.43	$ 0.985	$ 0.99	$ (1.54)	$ (0.21)	$ 6.32	$ 1.27	$ (6.61)
2	2008	B	B	B	M	N	0.165	$ 17,089.22	$ 17,084.66	$ 4.552	$ 9.62	$ 7.53	$ 16.77	$ 62.45	$ (40.21)	$ (17.68)
3	2013	B	B	B	N	N		$ 22,064.12	$ 22,063.66	$ 0.460	$ 0.46	$ (0.63)	$ 0.02	$ 1.56	$ 0.96	$ (2.07)
4	2013	B	B	B	M	N	0.165	$ 22,146.62	$ 22,144.59	$ 2.024	$ 10.87	$ 6.20	$ 14.77	$ 34.38	$ (25.76)	$ (6.59)
5	2008	L	L	B	N	N		$ 10,292.02	$ 10,291.66	$ 0.363	$ 0.36	$ (1.96)	$ (1.16)	$ (0.35)	$ 2.70	$ (1.98)
6	2008	L	B	B	N	N		$ 14,820.32	$ 14,819.33	$ 0.991	$ 0.99	$ (3.57)	$ (1.13)	$ (7.33)	$ 13.42	$ (5.09)
7	2008	L	H	B	N	N		$ 22,988.05	$ 22,986.06	$ 1.992	$ 1.99	$ (5.26)	$ (0.60)	$ (13.08)	$ 26.44	$ (11.38)
8	2008	B	L	B	N	N		$ 11,578.73	$ 11,578.30	$ 0.433	$ 0.43	$ (1.47)	$ (0.57)	$ 1.37	$ 1.60	$ (2.54)
9	2008	B	H	B	N	N		$ 27,342.45	$ 27,340.67	$ 1.784	$ 1.78	$ (1.74)	$ 0.25	$ 12.65	$ 1.67	$ (12.53)
10	2008	H	L	B	N	N		$ 12,997.39	$ 12,996.72	$ 0.665	$ 0.67	$ (0.15)	$ (0.48)	$ 6.68	$ (2.88)	$ (3.14)
11	2008	H	B	B	N	N		$ 19,537.64	$ 19,536.23	$ 1.412	$ 1.41	$ (1.69)	$ (1.31)	$ 3.36	$ 4.50	$ (6.45)
12	2008	H	H	B	N	N		$ 32,220.09	$ 32,217.66	$ 2.429	$ 2.43	$ (3.47)	$ (2.13)	$ (3.42)	$ 14.27	$ (8.41)
13	2013	L	B	B	N	N		$ 19,190.04	$ 19,189.37	$ 0.669	$ 0.67	$ (0.98)	$ 0.94	$ (4.56)	$ 8.33	$ (3.09)
14	2013	B	L	B	N	N		$ 14,451.11	$ 14,451.00	$ 0.105	$ 0.10	$ (0.14)	$ (0.10)	$ 2.04	$ (1.25)	$ (0.69)
15	2013	B	H	B	N	N		$ 36,771.10	$ 36,770.09	$ 1.004	$ 1.00	$ (1.75)	$ (0.36)	$ (0.76)	$ 6.40	$ (4.63)
16	2013	H	B	B	N	N		$ 25,399.42	$ 25,398.29	$ 1.127	$ 1.13	$ 2.46	$ (0.27)	$ 16.90	$ (15.48)	$ (0.29)
17	2013	H	H	B	N	N		$ 43,319.98	$ 43,317.80	$ 2.184	$ 2.18	$ 5.16	$ (0.18)	$ 28.26	$ (27.15)	$ 1.07
18	2013	H	L	B	N	N		$ 16,289.74	$ 16,289.27	$ 0.467	$ 0.47	$ 1.25	$ (0.48)	$ 10.34	$ (9.16)	$ (0.71)
19	2013	L	H	B	N	N		$ 31,104.95	$ 31,103.58	$ 1.372	$ 1.37	$ (2.06)	$ 1.64	$ (9.49)	$ 15.90	$ (5.04)
20	2013	L	L	B	N	N		$ 12,851.43	$ 12,851.35	$ 0.078	$ 0.08	$ (0.37)	$ 0.02	$ (0.25)	$ 0.97	$ (0.65)
21	2008	L	B	B	L	N	0.023	$ 14,821.01	$ 14,820.05	$ 0.954	$ 0.14	$ (3.12)	$ (1.32)	$ (7.97)	$ 14.06	$ (5.14)
22	2008	B	L	B	L	N	0.023	$ 11,580.55	$ 11,580.14	$ 0.409	$ (0.27)	$ (1.46)	$ (1.10)	$ 1.68	$ 1.67	$ (2.95)
23	2008	B	B	B	L	N	0.094	$ 17,042.86	$ 17,041.55	$ 1.315	$ 2.12	$ (0.35)	$ 1.91	$ 14.59	$ (4.64)	$ (8.63)
24	2008	B	H	B	L	N	0.023	$ 27,346.31	$ 27,344.81	$ 1.496	$ (2.34)	$ (2.01)	$ (2.98)	$ 8.47	$ 8.27	$ (15.24)

	Year	Load	Gas Price	Hydro	Market Pricing	Other	Joint Probability	Total Cost Without ($ mil.)	Total Cost With ($ mil.)	Societal Benefits ($ mil.)	Modified Societal Benefits ($ mil.)	CAISO Ratepayer Benefit ($ mil.)	CAISO Participant Benefit ($ mil.)	Consumer Benefit ($ mil.)	Producer Benefit ($ mil.)	Transmission Owner Benefit ($ mil.)
25	2008	H	B	B	L	N	0.023	$ 19,542.80	$ 19,541.62	$ 1.180	$ (0.36)	$ (1.85)	$ (2.96)	$ 3.80	$ 5.77	$ (8.40)
26	2008	L	L	B	M	N	0.023	$ 10,312.38	$ 10,311.09	$ 1.283	$ (0.53)	$ 0.48	$ 0.96	$ 10.20	$ (5.43)	$ (3.49)
27	2008	L	B	B	M	N	0.094	$ 14,834.49	$ 14,832.33	$ 2.168	$ 6.03	$ 2.68	$ 9.88	$ 19.00	$ (9.83)	$ (7.00)
28	2008	L	H	B	M	N	0.023	$ 23,011.70	$ 23,007.80	$ 3.901	$ 9.98	$ 4.99	$ 17.42	$ 32.28	$ (11.18)	$ (17.20)
29	2008	B	L	B	M	N	0.094	$ 11,628.38	$ 11,626.79	$ 1.593	$ (0.65)	$ 0.91	$ 1.82	$ 19.87	$ (11.83)	$ (6.45)
30	2008	B	H	B	M	N	0.094	$ 27,426.58	$ 27,419.63	$ 6.950	$ 10.05	$ 11.53	$ 21.47	$ 78.78	$ (41.45)	$ (30.38)
31	2008	H	L	B	M	N	0.023	$ 13,108.48	$ 13,104.54	$ 3.943	$ (1.99)	$ 3.11	$ 1.96	$ 31.11	$ (17.27)	$ (9.89)
32	2008	H	B	B	M	N	0.094	$ 19,677.08	$ 19,668.53	$ 8.557	$ 13.47	$ 10.88	$ 22.31	$ 71.72	$ (46.02)	$ (17.14)
33	2008	H	H	B	M	N	0.023	$ 32,474.14	$ 32,459.85	$ 14.290	$ 20.51	$ 18.09	$ 35.59	$ 103.48	$ (62.90)	$ (26.29)
34	2008	L	B	B	H	N	0.023	$ 14,853.97	$ 14,851.17	$ 2.807	$ 10.17	$ 5.20	$ 16.46	$ 29.96	$ (19.14)	$ (8.01)
35	2008	B	L	B	H	N	0.023	$ 11,673.88	$ 11,671.08	$ 2.794	$ 4.49	$ 2.92	$ 7.99	$ 23.33	$ (15.41)	$ (5.12)
36	2008	B	B	B	H	N	0.094	$ 17,139.20	$ 17,133.64	$ 5.552	$ 13.33	$ 9.62	$ 22.21	$ 56.47	$ (38.13)	$ (12.79)
37	2008	B	H	B	H	N	0.023	$ 27,518.94	$ 27,510.74	$ 8.207	$ 16.02	$ 15.21	$ 30.03	$ 73.53	$ (43.09)	$ (22.23)
38	2008	H	B	B	H	N	0.023	$ 19,801.84	$ 19,790.72	$ 11.124	$ 29.07	$ 15.89	$ 40.68	$ 92.46	$ (60.52)	$ (20.82)
39	2013	L	B	B	L	N	0.023	$ 19,190.86	$ 19,190.22	$ 0.642	$ 0.46	$ (0.59)	$ 1.17	$ (2.37)	$ 5.99	$ (2.98)
40	2013	B	L	B	L	N	0.023	$ 14,454.09	$ 14,454.06	$ 0.028	$ (1.26)	$ (0.45)	$ (1.37)	$ 1.27	$ 0.21	$ (1.44)
41	2013	B	B	B	L	N	0.094	$ 22,068.48	$ 22,068.09	$ 0.386	$ (0.02)	$ (0.39)	$ 0.03	$ 2.59	$ 1.35	$ (3.56)
42	2013	B	H	B	L	N	0.023	$ 36,779.05	$ 36,778.15	$ 0.904	$ (1.04)	$ (1.82)	$ (1.69)	$ (4.03)	$ 12.03	$ (7.10)
43	2013	H	B	B	L	N	0.023	$ 25,408.24	$ 25,407.43	$ 0.804	$ (2.62)	$ 1.24	$ (3.98)	$ 12.40	$ (9.67)	$ (1.93)
44	2013	L	L	B	M	N	0.023	$ 12,871.59	$ 12,871.05	$ 0.539	$ 1.22	$ 0.31	$ 1.82	$ 7.94	$ (3.71)	$ (3.69)
45	2013	L	B	B	M	N	0.094	$ 19,213.63	$ 19,212.71	$ 0.924	$ 3.10	$ 0.79	$ 4.65	$ 4.26	$ 1.48	$ (4.82)
46	2013	L	H	B	M	N	0.023	$ 31,140.60	$ 31,138.64	$ 1.963	$ 8.61	$ 2.03	$ 12.07	$ 13.82	$ (4.68)	$ (7.18)
47	2013	B	L	B	M	N	0.094	$ 14,511.99	$ 14,511.26	$ 0.724	$ 1.85	$ 2.14	$ 3.60	$ 16.55	$ (11.59)	$ (4.24)
48	2013	B	H	B	M	N	0.094	$ 36,887.54	$ 36,884.05	$ 3.483	$ 21.58	$ 10.07	$ 27.83	$ 67.81	$ (49.76)	$ (14.57)
49	2013	H	L	B	M	N	0.023	$ 16,433.29	$ 16,431.31	$ 1.983	$ 2.50	$ 4.96	$ 4.22	$ 27.49	$ (23.31)	$ (2.20)
50	2013	H	B	B	M	N	0.094	$ 25,615.13	$ 25,610.50	$ 4.625	$ 16.09	$ 13.02	$ 19.39	$ 64.98	$ (56.43)	$ (3.92)
51	2013	H	H	B	M	N	0.023	$ 43,632.24	$ 43,622.40	$ 9.839	$ 41.43	$ 29.38	$ 49.71	$ 137.33	$ (123.3)	$ (4.21)

	Year	Load	Gas Price	Hydro	Market Pricing	Other	Joint Probability	Total Cost Without ($ mil.)	Total Cost With ($ mil.)	Societal Benefits ($ mil.)	Modified Societal Benefits ($ mil.)	CAISO Ratepayer Benefit ($ mil.)	CAISO Participant Benefit ($ mil.)	Consumer Benefit ($ mil.)	Producer Benefit ($ mil.)	Transmission Owner Benefit ($ mil.)
52	2013	L	B	B	H	N	0.023	$ 19,255.96	$ 19,254.94	$ 1.021	$ 7.59	$ 1.96	$ 9.56	$ 11.66	$ (3.73)	$ (6.91)
53	2013	B	L	B	H	N	0.023	$ 14,575.78	$ 14,574.71	$ 1.071	$ 4.24	$ 3.02	$ 5.70	$ 16.90	$ (12.31)	$ (3.52)
54	2013	B	B	B	H	N	0.094	$ 22,241.41	$ 22,239.68	$ 1.732	$ 10.02	$ 5.04	$ 13.03	$ 32.05	$ (22.11)	$ (8.21)
55	2013	B	H	B	H	N	0.023	$ 37,032.37	$ 37,028.22	$ 4.149	$ 28.58	$ 10.70	$ 33.47	$ 67.92	$ (49.55)	$ (14.21)
56	2013	H	B	B	H	N	0.023	$ 25,841.18	$ 25,834.84	$ 6.337	$ 22.81	$ 17.21	$ 27.54	$ 59.61	$ (53.89)	$ 0.62
57	2008	B	B	D	N	N		$ 17,766.94	$ 17,765.41	$ 1.533	$ 1.53	$ 1.03	$ (0.20)	$ 19.84	$ (10.99)	$ (7.31)
58	2008	B	B	W	N	N		$ 14,611.03	$ 14,606.24	$ 4.791	$ 4.79	$ (2.62)	$ 2.62	$ 4.19	$ 6.39	$ (5.79)
59	2013	B	B	D	M	N		$ 23,489.25	$ 23,485.53	$ 3.717	$ 17.82	$ 12.02	$ 17.50	$ 63.79	$ (58.39)	$ (1.68)
60	2013	H	H	D	M	N		$ 46,569.80	$ 46,557.82	$ 11.983	$ 29.65	$ 35.50	$ 29.32	$ 70.06	$ (88.87)	$ 30.80
61	2013	B	B	W	M	N		$ 19,485.47	$ 19,481.01	$ 4.458	$ 11.39	$ 2.31	$ 14.58	$ 23.67	$ (4.58)	$ (14.63)
62	2013	H	H	W	M	N		$ 37,762.94	$ 37,751.70	$ 11.239	$ 23.98	$ 19.87	$ 35.10	$ 83.49	$ (58.04)	$ (14.22)
63	2008	B	B	B	M	SO		$ 17,482.44	$ 17,475.45	$ 6.988	$ 8.08	$ 11.64	$ 19.76	$ 58.89	$ (43.48)	$ (8.42)
64	2008	B	B	B	M	DC		$ 17,124.34	$ 17,116.86	$ 7.482	$ 19.50	$ 14.51	$ 29.22	$ 75.00	$ (53.26)	$ (14.26)
65	2013	B	B	B	M	U		$ 22,969.96	$ 22,967.43	$ 2.531	$ 4.80	$ 4.41	$ 9.53	$ 37.99	$ (23.12)	$ (12.34)
66	2013	H	H	B	M	U		$ 45,891.39	$ 45,875.96	$ 15.436	$ 35.33	$ 24.18	$ 45.24	$ 104.73	$ (70.35)	$ (18.95)
67	2013	B	B	B	M	SO		$ 22,649.80	$ 22,647.10	$ 2.691	$ 14.42	$ 9.05	$ 21.26	$ 38.83	$ (31.17)	$ (4.97)
68	2013	H	H	B	M	SO		$ 45,005.07	$ 44,996.28	$ 8.797	$ 21.87	$ 18.88	$ 33.24	$ 77.04	$ (67.93)	$ (0.32)
69	2013	B	B	B	M	DC		$ 22,186.12	$ 22,181.47	$ 4.646	$ 23.07	$ 14.69	$ 31.55	$ 76.90	$ (60.73)	$ (11.52)
70	2013	H	H	B	M	DC		$ 43,774.46	$ 43,759.52	$ 14.940	$ 60.97	$ 36.57	$ 73.02	$ 137.71	$ (132.3)	$ 9.52
71	2013	B	B	B	M	KW		$ 22,150.32	$ 22,148.40	$ 1.925	$ 10.40	$ 6.89	$ 14.61	$ 35.19	$ (26.45)	$ (6.82)

7 Appendix B

Nodes	Names
24147	SYLMARS
26094	SYLMARLA
26097	SYLMAR1
26098	SYLMAR3
26099	SYLMAR2
26100	SYLMAR4
40111	BIG EDDY
41311	CELILO1
41314	CELILO4
41341	BIGEDDY1
79265	CELILO3P
79266	SYLMAR3P
79267	CELILO4P
79268	SYLMAR4P

8 Glossary

Term/Acronym	Definition
TEAM	Transmission Economic Assessment Methodology
CPUC	California Public Utilities Commission
CAISO	California Independent System Operator
PLEXOS™	A production-costing model developed by Drayton Analytics (www.plexos.info) used for the Path 26 study described in the TEAM Report.
PDCI	Pacific DC Intertie, connecting the Northwest with the Los Angeles basin via a pair of controllable DC lines.
IPP	Independent Power Producer – an owner of generating assets that sells energy from these assets to wholesale energy markets or load serving entities