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SCENARIO ANALYSES OF CALIFORNIA'S ELECTRICITY SYSTEM: PRELIMINARY RESULTS FOR THE *2007 INTEGRATED ENERGY POLICY REPORT*

ADDENDUM

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BACKGROUND

The staff report *Scenario Analyses of California's Electricity System* (*Scenario Report*), issued in June 2007, documents a wide ranging set of results, assumptions, and methods used to assess a series of thematic scenarios emphasizing preferred resource strategies to reduce greenhouse gas (GHG) emissions. Despite a desire to address key uncertainties through sensitivity assessments, numerous uncertainties could not be assessed quantitatively. These are discussed in general terms in Chapter 9 of that report.

This addendum, prepared for the July 9, 2007, Integrated Energy Policy Report (IEPR) Committee Workshop, is intended to provide further insight about the project, both findings and limitations, to help reviewers gauge how they might use the results to establish or revise energy policies.

This brief report has three primary purposes:

- It provides an overview of the key results that may be difficult to discern from the lengthy documentation provided in the *Scenario Report*;
- It packages the sensitivity results provided in the *Scenario Report* in a way to make these more clear for the key variables of interest to California policymakers and makes more specific the fact that uncertainties exist that affect these results and that have not yet been investigated.
- It summarizes whether the scenario assumptions and results address the goals already established in previous policy reports or decisions.

OVERVIEW OF KEY SCENARIO REPORT RESULTS

This section is intended to communicate some key insights that California Energy Commission (Energy Commission) staff learned as a result of the project.

Table 1 on page 11 provides some basic results of the assessment of the nine thematic scenarios, each of which reports key results of direct interest to California and other Western policy makers. Three different geographic groupings are reported—California, Rest-of-WECC, and total WECC. The system cost value is the year 2020 value for all costs above and beyond those common to all scenarios.[1] GHG emissions are the emissions from power plants located in California, Rest-of-WECC, and all of WECC, respectively.[2] Differences among the results of these are intended to be accurate depictions of differences between any two scenarios.

Table 1 can be examined from multiple perspectives. From the traditional energy policy maker perspective, Case 3A and Case 3B are the lowest cost in year 2020. Using the set of technology costs and fuel prices in this study, policy makers pursuing "least cost" goals would want to pursue the energy efficiency strategy, because it has the lowest total system cost. If other technology and program administration costs were assumed, other conclusions might be reached. The lowest GHG emissions (using the measure of carbon emissions from power plants) are found in Case 5A and Case 5B. The policy maker valuing lowest GHG emissions would want this strategy that combines both energy efficiency and renewable generation. As noted at length in Chapter 6 of the *Scenario Report*, California policy makers should recognize that Cases 3B, 4B, and 5B are more advantageous to California than are the corresponding Cases 3A, 4A, and 5A in which the strategy is only implemented in California.

Table 2 on page 12 provides a computation of the levelized cost per unit of power sold from 2009 to 2020 for each of the three regions and eight of the nine thematic scenarios. Scenario 2 is omitted since the sensitivities were not investigated for this case. Table 2 remedies a limitation of the cost computation of Table 1, which includes only those incurred in year 2020. (Treating multi-year investments in energy efficiency or power generation facilities as single year expenditures can be misleading. Levelizing the stream of expenses and other

[1] System costs include all production costs, other costs and those capital costs for transmission and generation capacity added in any scenario or deleted in any scenario. Energy efficiency and solar photovoltaic costs are included in system costs. Supply-side renewable generating technology investments are included with traditional generating facility capital costs. Some examples will clarify. A generic fossil addition included in Case 1, but removed in Cases 1B through 5B would be included in the system costs of Case 1 and no other scenario. A named addition that became operational in year 2007 would not be included in system costs because it is common to all scenarios.

[2] Unlike some of the ways of reporting results in Chapters 6-8 of the *Scenario Report*, the California results reported in Table 1 are just those power plants located within California. Power plants classified as "remote" or power generation purchases called "imports" are included in Rest-of-WECC.

costs provides a truer picture of the stream of costs resulting from new technologies and benefits from those costs over time.) In Table 2, and specifically upon the Base column in each of the three geographic regions, a somewhat different picture emerges than the corresponding picture from Table 1. First, Case 1 is now shown to be the lowest cost per unit of power purchased in all three regions.[3] The mixed Case 1B (Current Requirements), with elements of energy efficiency, renewables, and solar photovoltaic (PV), is the second lowest cost per unit. Among the remaining strategies, energy efficiency is still the least cost per unit of power purchased. Table 2 also shows the impacts on levelized costs of the sensitivity assessment using low and high natural gas prices. This will be discussed below.

Table 3 on page 13 makes use of a portion of the California data reported in Table 1 to compute the incremental cost of GHG reductions measured as dollars per ton ($/ton) of carbon reduction. Table 3 was constructed from Table 1 by subtracting the values for the Case 1B row from each of the other rows for the California cost and GHG emissions columns. The result is the change in system cost and GHG emissions relative to Case 1B for strategies implemented in California. The final column divides the cost differences by the emission reduction differences to get a very rudimentary cost effectiveness measure. Note that values for Case 3B, 4B, and 5B are not reported. Since California policy makers cannot make the policy decisions to implement Cases 3B, 4B, or 5B, it would be misleading to report any measures of cost-effectiveness using just California costs.

Contribution to Overall AB 32 GHG Emission Reductions

Despite creating scenarios that evaluate the consequences of aggressive penetrations of energy efficiency, roof top solar PV, and supply-side renewable generating technologies commonly under discussion in the electricity industry, no scenario achieves the 1990 standard of Assembly Bill 32 (Nuñez) Chapter 488, Statutes of 2005 and that California Air Resources Board is attempting to achieve through its ongoing regulatory program.

Figure 1 on page 14 plots the California power generation emissions of carbon for the various scenarios using a format comparable to Figure 6-5, page 131, of the *Scenario Report*. Added to that figure is a historic value for 2005 of 48.98 million tons, taken from the Energy Commission inventory for California GHG emissions.[4] Also added is the 2020 carbon goal for the electricity sector, which is the 1990 value of 43.36 million tons.[5] Even the most aggressive scenario for actions currently identified for California—for example, Case 5A—does not reach the 2020 target. The Case 5B result comes the closest, but as noted earlier,

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[3] The term "per unit of power purchased" reflects the decrease in electrical energy usage by end-users because of energy efficiency savings from the base energy load forecast common to all scenarios. This treatment reflects the common rate design problem of a smaller amount of power purchased by end-users recovering some or all of the costs by end-users to avoid such purchases. It can lead to higher "rates" and smaller bills.

[4] California Energy Commission, 2006, *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004,* publication no. CEC-600-2006-013-SF, p. 25.

[5] Ibid.

California policy makers cannot achieve the implementation of Case 5B without the cooperation of other Western state leaders.[6]

Interactions with Rest-of-WECC

As the electricity and natural gas industries fully understand, California's portions of these industries are inextricably linked to the networks covering the entire West. The Western Interconnection is electrically isolated from the other two interconnections except for weak direct current transmission links that can be carefully controlled to send power one direction or another. The natural gas pipeline system is more interconnected with the entire North American network of producing regions, liquefied natural gas (LNG) import facilities, and interstate pipelines.

Table 1 and Figure 1 show that the predicted California emissions in Case 5B are lower than in Case 5A because the extension of the high efficiency and high renewables features of Case 5A to Rest-of-WECC in Case 5B creates surplus capacity in Rest-of-WECC that is cheaper to run than that which exists in California; thus, imports to California from Rest-of-WECC increase in Case 5B. This allows emissions from power generating facilities located in California to decrease compared to Case 5A, which has the identical set of generating resources as in Case 5B, but is operated differently. From a California perspective, this is a benefit, but from a West-wide or world perspective, this is not a benefit because the Rest-of-WECC power plants that are operated to serve California loads still emit carbon into the atmosphere.

California's Cheapest Strategy Is to Work with Its Neighbors

More generally, the results of the scenario assessments show that the West-wide versions of thematic scenarios always have lower California costs than the corresponding energy strategies implemented just in California. This means that scenario Case 3B is cheaper than Case 3A, Case 4B is cheaper than Case 4A, and scenario 5B is cheaper than Case 5A. Staff understands this to be the generalization of the point made above about California carbon emissions. That is, whenever the West pursues a strategy to reduce electricity usage like energy efficiency or to create a more benign resource mix through rooftop solar PVs or supply-side generating technologies, surplus resources are created in Rest-of-WECC that are cheaper to operate than California resources. Thus, the production cost model, mimicking the real world, dispatches those resources rather than California resources. This means California imports more under these circumstances, and total system costs for California electricity consumers decline.

In contrast, Table 1 shows that Rest-of-WECC systems costs in Case 5B are slightly higher than in case 5A, but carbon emissions of all power plants located in Rest-of-WECC are much lower. (This tabulation of Rest-of-WECC carbon emissions includes those power plants supporting California loads.) The reduction in carbon emissions may well prove desirable to Rest-of-WECC policy

[6] Six Western states and the province of British Columbia have pledged to pursue actions to achieve GHG emission reductions.

makers, since its cost penalty is so small.[7] It would seem that California should be communicating these results to Rest-of-WECC policy makers to interest them in pursuing carbon emission reduction objectives. Although not all Western states may join in these efforts, the six states (Arizona, California, New Mexico, Oregon, Utah and Washington) that have pledged through a Memorandum of Understanding (February 2007) to pursue GHG reduction strategies are a majority of the electrical loads within WECC, and thus would be able to achieve the majority of the energy efficiency savings included in Cases 3B and 5B. Most of these states already have a renewable portfolio standard (RPS) and are thus familiar with creating mechanisms to encourage utilities to add such resources.[8]

[7] Appendix D-1 of the *Scenario Report* provides a limited set of results for the baseline cases for each of the 29 transareas used in the analysis. These transarea results could be used to identify whether there are "winners" and "losers" resulting from these scenarios.

[8] Scenario Report, Figure 2-6, page 32. Oregon adopted an RPS in 2007.

UNCERTAINTY OF RESULTS

In the design of the project, uncertainty was well recognized, but the time and resources available to the study did not permit an exhaustive study of all variables. Three forms of sensitivity assessment are reported in Chapter 8 of the *Scenario Report*: (1) fuel prices, (2) "shocks" not expected to occur frequently, and (3) stochastic assessment of variables likely to change from expected values repeatedly during the period of study. Numerous other variables were recognized as being uncertain and could not be assessed quantitatively, but are amenable to qualitative assessment. This section discusses both types of uncertainties.

Sensitivity of Results Evaluated Quantitatively

Table 4 on page 15 shows the results for the various scenarios focusing upon California system costs and California carbon emissions, since these variables are of most direct interest to California policy makers. The central point of the cluster of five values is the baseline set of results, while the four remaining points are the sensitivity variations of costs or emissions around the center point as assessed in the formal sensitivity studies.

Table 4 reveals the sensitivity of some key results to fuel prices and hydro-generation quantities. The five values reported in each cell represent the results of explicit sensitivity assessments. System costs in year 2020 are quite sensitive to fuel prices, but much less sensitive to hydro-generation variations. Conversely, carbon emissions in year 2020 from California power plants are quite sensitive to hydro-generation levels, but quite insensitive to fuel price variations. Further, the sensitivities of these two variables decline as preferred resources are added and fossil-fueled generation declines in importance. These results match intuitive guesstimates, although the analysis provides some degree of quantification about the relative importance of these uncertainties that might not have been well understood.

Taking the Case 1 California System Cost cell as an illustration of how to read Table 4, five values are reported. The center value of the five is the total system cost in billions of 2006 dollars with baseline fuel prices and baseline hydro-generation production. The left and right values report the fuel prices sensitivity assessment reported in Section 8.1 as system and production costs per unit of power sold. Here the result is the actual magnitude of costs. The upper and lower values within the cluster of five entries in the cell report system costs under high hydro-electric generation production patterns and low hydro-electric production patterns. There is much greater "swing" from fuel price changes than from hydro-electric variations.

The next cell to the right on Table 4 illustrates the sensitivity results on California carbon emissions. For this variable, the variation resulting from natural gas prices, as shown by left and right values, is much less than the variation from hydro-electric generation shown as upper and lower values in the five value cluster.

Finally, the yellow highlighting on one of the five values in each cluster is the highest one of the five. In all scenarios, the highest system cost value occurs with the high fuel price case. Similarly, in all scenarios, the highest carbon emissions occur with the low hydro-electric generation "shock."

There are numerous other sensitivities to other variables for which no formal sensitivity assessment was conducted. Some of these could be assessed quantitatively in a manner similar to the formal sensitivity results, but others could not.

Implications of Uncertainties Not Evaluated Through Sensitivity Studies

Chapter 9 of the *Scenario Report* discusses numerous uncertainties that could not be investigated within the time and resources of this project. This section uses a qualitative discussion of two uncertainties to illustrate that a qualitative assessment could be performed that would build upon the quantitative sensitivity assessment completed to date. It is possible that sufficient review in this manner could both lead to insights and facilitate decisions about additional quantitative assessments in a future study.

Energy efficiency and hydro variations will be examined as illustrations of how qualitative assessment can extend understanding of the results quantified through the sensitivity analyses documented in Chapter 8.

Uncertainties About Energy Efficiency

In the first illustration, the rows of Table 4 depicting Case 3A can be examined in greater detail. The baseline hydro-generation row and the baseline fuel price column duplicate the deterministic results for Case 3A reported in Chapter 6 of the *Scenario Report*. The other four values in the cluster reflect the quantitative assessment results provided in Chapter 8. Three additional uncertainties are evaluated qualitatively in Table 5:

- Change in administrative cost per unit of savings assumed.
- Change in measure costs per unit of savings.
- Emerging energy efficiency potential develops as expected in the Itron potential study.

Each of these can be expected to have changes that increase or decrease costs of implementation of an energy efficiency strategy or increase or decrease realized savings and, therefore, affect fuels used in power generation. Changes in cost do not necessarily lead to changes in energy production from generating resources; rather, each must be evaluated for this consequence and then translated through a production costing technique to determine expected changes in GHG emissions compared to the assumptions made in the *Scenario Report*.

Administrative cost per unit of energy saved could either be higher or lower than assumed in this study. Higher costs might result from greater efforts required to persuade end users to voluntarily participate in programs. Lower costs might result if programs were implemented through mandatory

requirements. Either higher or lower costs could occur without affecting savings realized if budgets were flexible and savings goals were deemed a higher priority than staying within budget. Thus, while a mechanistic assessment of cost sensitivity to administrative program costs could provide further sensitivity results, the implications on GHG emission reductions requires a more complex specification of the entire energy efficiency program design along with specification of degrees of operational flexibility granted to program administrators.

Table 5 on page 16 provides an initial indication of the similar uncertainties associated with measure cost differences and of whether emerging potential develops as predicted in the Itron potential study. Again, while limited variations could be assessed in a sensitivity study, the broad issues raised by these uncertainties are very complex and not easily reduced to simple evaluations.

Design of Load Serving Entities Compliance Mechanisms Based Upon Hydro-Variations

As a second illustration of qualitative uncertainty assessment, consider how the scenario project results might influence compliance mechanisms for individual load serving entities (LSE). Table 4 on page 15 summarized the sensitivity results of Chapter 8 of the *Scenario Report* for the hydro-electric variations universally recognized to exist. These results are reminders that any compliance program for specific load serving entities (LSE) has to be able to accommodate the variation in GHG emissions that necessarily result from an electricity system that relies upon hydro-electric generation as a substantial source supplying end-user power demands.

Compliance mechanisms could be designed that:

1. Assume adverse hydro-electric generation of energy in design of resource portfolios; thus, by choosing to use the lower end tail of the hydro-electric generation distribution there will almost certainly be <u>greater</u> levels of hydro-electric generation in nearly all future years and <u>lower</u> emissions of GHG in the real world.[9]
2. Plan for average hydro-electric generation and design compliance mechanisms to recognize "shortfalls" caused by hydro-electric variations:
    a. The degree of flexibility allowed would have to be designed for the specific level of hydroelectric generation expected compared to other resources.
    b. Individual LSEs could have quite different exposures to hydro-electric generation variability, so the degree of flexibility authorized might necessarily be unique to each LSE.

The *Scenario Report* cannot speak to the many issues raised by hydro-electric variation, but it can provide policy makers with a rough sense of the extremes that might be expected, in the aggregate, from all LSEs. Since the "shock" investigated in this study represents the WECC-wide extremes, or very close

[9] Also assuming no change in the distribution of hydro-electric generation in future years compared to the historic period.

thereto, the actual hydro-electric variation that a compliance program must be designed to address in any one year is likely to be smaller than these results imply.

SUMMARY OF SCENARIO REPORT RESULTS COMPARED TO ENERGY POLICY GOALS

State law, a wide range of CPUC and Energy Commission policy statements, *Energy Action Plans I* and *II*, and the Governor's statements all discuss various policy goals for certain types of resources that are "preferred." The obvious resource types with a long history of policy preference are energy efficiency and renewable generating resources. In recent years, rooftop PV has been added in the form of the California Solar Initiative. Other elements of distributed generation have been added conceptually, but without a numeric goal yet being established. Similarly, 2005 legislation focused attention on repowering of existing thermal facilities that are aged and otherwise candidates for retirement.[10] In 2006, AB 32 added reduction of greenhouse gases to this list of energy goals, since the majority of GHG emissions come from anthropogenic combustion of carbon fuels to release carbon into the atmosphere in a gaseous form.

Table 6 on page 17 provides an assessment of whether the various scenarios designed for and evaluated in this *Scenario Report* satisfy a simplified set of these policy goals. The various cases were designed to include ones that meet or exceed existing goals, but even the combination of high energy efficiency and high renewables in Case 5A fails to achieve the general goal established in AB 32 for GHG reduction for all sectors. Thus, even though there are numerous qualifications about the feasibility of achieving the assumptions of some of these scenarios, even further GHG reductions are needed. Furthermore, the largely untapped GHG emission reductions associated with existing or named additions of coal generation are not an element of California's carbon emission inventory, so that a much more difficult set of choices will be needed in order to achieve the AB 32 overall goal within the electricity sector.

The following questions seem pertinent:

- Are these results consistent with other studies, or is there some unique element that leads this study to this conclusion?
- Are the energy efficiency and renewables penetrations assumed in this study reasonable, or could more be achieved with sufficient time, money, and effort?
- What additional elements of a resource procurement strategy might be needed to facilitate achieving emission reductions from the electricity sector corresponding to the general reduction goal of AB 32?

[10] Assembly Bill 1576 (Nuñez, Chapter 374, Statutes of 2005)

Table 1: Summary of Deterministic Results for Thematic Scenarios

Thematic Scenarios	California		Rest-of-WECC		Total WECC	
	2020 System Costs ($2006 000)	2020 GHG Emissions (000 tons)	2020 System Costs ($2006 000)	2020 GHG Emissions (000 tons)	2020 System Costs ($2006 000)	2020 GHG Emissions (000 tons)
Case 1 - Current Conditions	16,684,128	75,803	28,390,572	444,063	45,074,700	519,866
Case 1B - Current Requirements	16,354,098	63,907	27,492,976	435,120	43,847,073	499,027
Case 2 - Sustained High Fuel Prices	18,253,593	60,164	29,476,406	425,945	47,729,998	486,110
Case 3A - High EE in Calif. Only	15,701,704	60,032	27,282,068	433,257	42,983,772	493,289
Case 3B - High EE West-wide	15,576,942	54,868	24,947,286	398,888	40,524,229	453,755
Case 4A - High Renewables in Calif. Only	18,935,010	58,078	26,593,399	425,669	45,528,410	483,747
Case 4B - High Renewables West-wide	18,904,156	54,172	28,619,739	398,868	47,523,895	453,040
Case 5A - High EE and Rewables in Calif. Only	18,407,604	54,836	26,336,758	423,158	44,744,362	477,994
Case 5B - High EE and Rewables West-wide	18,238,302	46,356	26,898,134	348,793	45,136,436	395,149

Table 2: Levelized System Costs ($2006/MWh)

		California			Rest of WECC			WECC		
		Low NG	Base	High NG	Low NG	Base	High NG	Low NG	Base	High NG
Case 1 - Current Conditions	High Hydro									
	Base	31.87	40.90	46.68	24.92	29.12	31.53	27.19	32.94	36.44
	Low Hydro									
Case 1B - Current Requirements	High Hydro									
	Base	38.27	46.38	51.54	25.44	29.31	31.53	29.47	34.67	37.81
	Low Hydro									
Case 3A - High EE	High Hydro									
	Base	38.71	46.67	51.75	25.37	29.20	31.40	29.50	34.63	37.71
	Low Hydro									
Case 3B - High EE	High Hydro									
	Base	38.59	46.43	51.39	28.63	32.09	34.01	31.84	36.70	39.60
	Low Hydro									
Case 4A - High Renewables	High Hydro									
	Base	43.59	51.14	55.95	25.38	29.15	31.30	30.98	35.94	31.30
	Low Hydro									
Case 4B - High Renewables	High Hydro									
	Base	43.55	51.06	55.86	26.68	30.16	32.12	31.89	35.94	39.47
	Low Hydro									
Case 5A - High EE and Rewables	High Hydro									
	Base	44.31	51.70	56.42	25.30	29.02	31.14	31.06	35.93	38.85
	Low Hydro									
Case 5B - High EE and Rewables	High Hydro									
	Base	44.15	51.29	55.81	30.08	33.21	34.93	34.53	38.95	41.57
	Low Hydro									

Table 3: Measuring Cost Effectiveness of Strategies by Assessing Differences from Case 1B

Thematic Scenarios	2020 System Cost Difference	2020 GHG Emission Difference	2020 Reduction ($/ton)
Case 1 - Current Conditions	330,030	11,895	-27.74
Case 1B - Current Requirements	0	0	NA
Case 2 - Sustained High Fuel Prices	1,899,495	-3,743	507.50
Case 3A - High EE in Calif. Only	-652,394	-3,876	-168.34
Case 3B - High EE West-wide			
Case 4A - High Renewables in Calif. Only	2,580,912	-5,829	442.75
Case 4B - High Renewables West-wide			
Case 5A - High EE and Rewables in Calif. Only	2,053,506	-9,071	226.37
Case 5B - High EE and Rewables West-wide			

Figure 1: California Carbon Emissions Compared with Implied Generation Sector Target

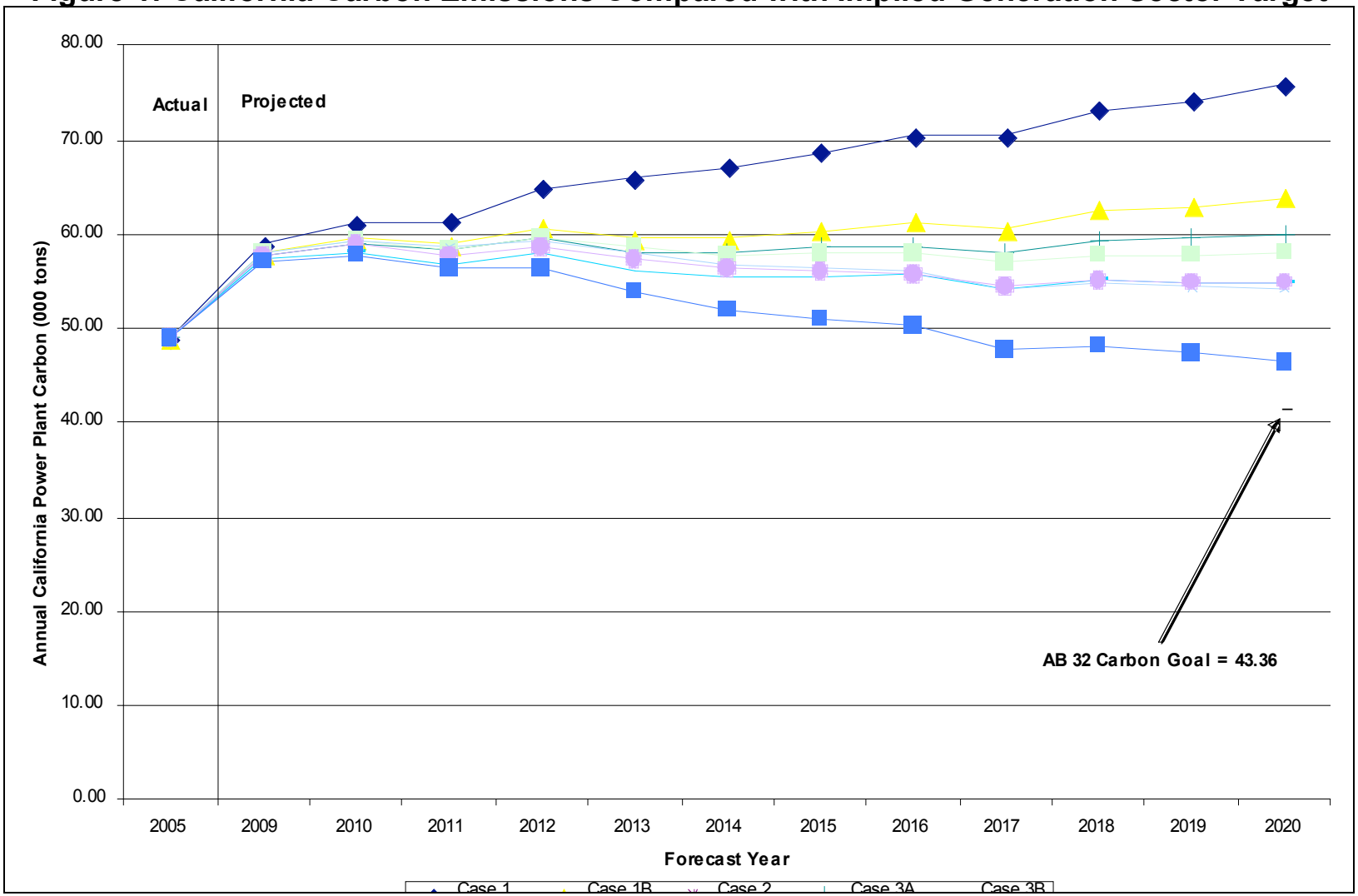

Table 4: Summary of California System Costs and Carbon Emissions for Year 2020

Thematic Scenarios		Calif. System Costs			Calif. Carbon Emissions		
		Low NG	Base	High NG	Low NG	Base	High NG
Case 1 - Current Conditions	High Hydro		16,164,681			69,142	
	Base	12,265,962	16,684,128	19,177,074	74,630	75,803	76,034
	Low Hydro		16,875,608			79,968	
Case 1B - Current Requirements	High Hydro		15,945,868			58,866	
	Base	13,004,270	16,354,098	18,224,842	63,100	63,907	63,850
	Low Hydro		16,507,640			67,441	
Case 3A - High EE in Calif. Only	High Hydro		15,299,757			55,124	
	Base	12,617,673	15,701,704	17,434,336	59,156	60,032	60,221
	Low Hydro		15,843,813			63,401	
Case 3B - High EE West-wide	High Hydro		15,077,660			49,691	
	Base	12,569,545	15,576,942	17,257,192	55,004	54,868	54,762
	Low Hydro		15,757,903			57,804	
Case 4A - High Renewables in Calif. Only	High Hydro		18,617,701			53,438	
	Base	16,452,327	18,935,010	20,318,987	57,233	58,078	58,338
	Low Hydro		19,039,752			60,914	
Case 4B - High Renewables West-wide	High Hydro		18,501,518			49,585	
	Base	16,443,014	18,904,156	20,272,379	53,804	54,172	54,268
	Low Hydro		19,055,587			56,826	
Case 5A - High EE and Rewables in Calif. Only	High Hydro		18,121,512			50,467	
	Base	16,184,232	18,407,604	19,636,497	54,047	54,836	55,030
	Low Hydro		18,491,545			57,592	
Case 5B - High EE and Rewables	High Hydro		17,799,534			42,429	
	Base	16,145,825	18,238,302	19,369,073	46,848	46,356	46,068

Table 5: Implications on Energy Efficiency Results of Additional Uncertainties

Uncertainty	System Cost Implications for California	GHG Emission Implication for California Power Plants
1. Change in administrative cost per unit of savings assumed:		
a. Increase as voluntary programs are pushed harder to achieve greater participation	Higher total costs than basecase results	None
b. Reductions as mandatory programs are pursued rather than voluntary ones	Lower total costs than basecase results	None
2. Change in measure costs per unit of savings:		
a. higher engineering and distribution costs of physical equipment included in measures	Minimal change as long as expenditures are capped by available funding	Decreased GHG reductions
b. lower production and distribution costs of physical measures	Minimal change as long as expenditures are capped by available funding	Increased GHG reductions
3. Emerging Potential develops as expected in the Itron Potential Study, and:		
a. lower cost measures substituted for high cost ones	Total costs would be lower	GHG emissions would be unchanged
b. additional savings pursued from measures now "cost effective"	realized savings would be higher	GHG emissions reduced as more efficiency measures implemented

Table 6: Summary of Scenario Features Relative to Satisfying California Policy Goals

Scenario	Energy Efficiency	Rooftop Solar PV	Supply-Side Renewables	Green House Gases
Case 1 – Current Conditions	No	No	No	No
Case 1B – Current Requirements	Falls a bit short in early years, but exceeds all known goals in long-term	No	Meet RPS law energy target in longer-term	No
Case 3A – High Energy Efficiency	Exceeds 2013 IOU goals and any known POU goals	No	Exceed if interactions with EE goals accommodated	No
Case 4A – High Renewables	No	Exceeds CSI goal	Exceed	No
Case 5A – Both High EE and Renewables	Exceed	Exceeds CSI goal	Exceed	No