

**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE
STATE OF CALIFORNIA**

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Order Instituting Rulemaking to Implement the)
Commission's Procurement Incentive Framework)
and to Examine the Integration of Greenhouse)
Gas Emission Standards into Procurement)
Policies.)
)

Rulemaking 06-04-009
(Filed April 13, 2006)

BEFORE THE CALIFORNIA ENERGY COMMISSION

In The Matter Of,)
) Docket 07-OIIP-01
AB 32 Implementation – Greenhouse Gas)
Emissions.)
)

REPLY COMMENTS OF SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E)
ON MODELING-RELATED ISSUES

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Dated: **January 18, 2008**

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Pursuant to the Administrative Law Judges' Ruling Extending Comment Deadlines and Addressing Procedural Matters, issued November 30, 2007, Southern California Edison Company (“SCE”) respectfully submits these reply comments on the documentation for the model created by Energy and Environmental Economics, Inc. (“E3”) to assess how different methods of reducing greenhouse gases (“GHG”) will achieve emission reduction goals for the electricity sector and how such reductions will affect utility costs and consumers’ electricity bills.

I.

GHG EMISSIONS COSTS SHOULD BE INCORPORATED INTO THE OPERATING COSTS OF GENERATING FACILITIES

In its opening comments, the Southern California Public Power Authority (“SCPPA”) asserts that incorporating GHG emissions costs into the operating costs of generating facilities to alter dispatching should not be considered an appropriate emission reduction measure.¹ In particular, SCPPA argues that the “adverse impact of internalizing the cost of GHG emissions in wholesale electricity prices could be substantial and could have a profoundly adverse economic impact on consumers.”² SCPPA relies on an analysis presented in this proceeding by Bruce Biewald of Synapse Energy, Inc.³ SCE disagrees with SCPPA. Incorporating GHG emissions costs into the operating costs of generating facilities is a cost-effective and efficient way to reduce emissions.

Internalizing emissions costs allows the market to find the lowest cost options to reduce GHG emissions. When emissions costs are internalized into the operating costs of generating facilities, and thus into wholesale power prices, there is a price signal to the market which creates an economic incentive to reduce GHG emissions. Sending this price signal to the market encourages energy efficiency, conservation, development of clean resources, and innovation in new clean technology, without the need for complex and difficult to administer regulations. Regulators do not have the burden to administratively determine the most effective means to reduce GHG emissions. The price signal to the market incentivizes the most cost-effective GHG reduction options.

Furthermore, while internalizing GHG emissions costs will increase the cost of power, utilizing a market will be more cost-effective than command and control measures in reducing GHG emissions. According to the Electric Power Research Institute (“EPRI”), command and

¹ SCPPA Opening Comments at 2-5.

² *Id.* at 4.

³ *Id.*

control GHG regulations would diminish economic welfare 30% more than a comprehensive market system.⁴

Finally, the Synapse Energy, Inc. analysis relied on by SCPPA in its opening comments is flawed. For the reasons stated in the SCE/Pacific Gas and Electric Company (“PG&E”) presentation attached hereto as Appendix A, the Synapse Energy, Inc. model has significant flaws and the results distort the economic impacts under load-based and source-based GHG emissions caps, greatly overstating the benefits of a load-based cap. Neither E3 nor the California Public Utilities Commission (“CPUC”) and California Energy Commission (“CEC”) should not use the Synapse Energy, Inc. analysis in their GHG modeling efforts.

II.

E3’S MODEL IS NOT APPROPRIATE TO ANALYZE GHG SCENARIOS ON A LOAD-SERVING ENTITY BASIS

SCE’s opening comments explain that, although E3’s data assumptions and modeling approach will provide results that may be appropriate for a statewide analysis of GHG scenarios in the electricity sector, E3’s analysis is not appropriate on an individual load-serving entity (“LSE”) basis. Among other things, E3 appears to use the same emission rates for each fuel type, which may result in inaccurate GHG emissions levels, especially for those emissions from combined cycle units burning natural gas. Moreover, E3’s modeling assumptions reflect specific information pertaining to the five largest electric utilities in California, but minimal information pertaining to the many other LSEs operating within California. Modeling GHG scenarios for some, but not all, California LSEs will lead to inaccurate information and could lead to decisions that are not only inaccurate but more costly to implement. Finally, E3’s modeling assumption that an LSE that owns a generator or has entered into a power purchase agreement with a

⁴ EPRI, Program on Technology Innovation: Economic Analysis of California Climate Initiatives: An Integrated Approach, Volume 1: Summary for Policymakers at § 3.2.2, 3-6 (June 2007) (available at www.epriweb.com/public/00000000001014641.pdf).

generator is allocated that unit's energy proportional to the ownership share is problematic. While that assumption may be correct for a market that operates without bilateral agreements and where all contracts for capacity include exclusive assignment of generated energy, this scenario does not reflect either the current or projected future operation of the California electricity market. An LSE with a contract for a unit's capacity may not have any contractual commitment for the unit's energy, and bilateral agreements exist between entities that allow energy transfer without capacity transfer. Therefore, E3's assumptions do not reflect actual operating conditions.

Other parties' opening comments support SCE's conclusion that E3's modeling is problematic at the LSE level. The Northern California Power Agency ("NCPA") states that E3's model does not provide accurate or adequate information about publicly-owned utilities.⁵ Similarly, the Sacramento Municipal Utility District ("SMUD") asserts that E3 failed to accurately attribute all of SMUD's specified resources to SMUD.⁶ San Diego Gas & Electric Company ("SDG&E") and Southern California Gas Company ("SoCalGas") note that they disagree with most of the assumptions in the E3 model used to derive entity-specific results.⁷ Finally, the Los Angeles Department of Water and Power ("LADWP") notes the problems with E3's assumptions about LSE resource planning in 2020, and states that "unintended consequences can arise" when extrapolating E3's modeling to LSE-specific results as would be done in Stage 2.⁸

SCE agrees with these parties' concerns regarding the accuracy of LSE-specific results in E3's modeling and the application of the E3 model to GHG scenarios at the LSE level. For these reasons, SCE believes the E3 model should not be applied to model scenarios on an individual LSE basis. Moreover, as SCE has explained in prior comments, accounting for GHG emissions under a source-based or first seller approach is more accurate than accounting for such emissions

⁵ NCPA Opening Comments at 2.

⁶ SMUD Opening Comments at 7.

⁷ SDG&E/SoCalGas Opening Comments at 8.

⁸ LADWP Opening Comments at 5-9.

under a load-based approach. Therefore, E3's modeling of actual GHG emissions will be more accurate if a source-based or first seller model is used.⁹

III.

E3 SHOULD MODEL DIFFERENT FUEL PRICE SCENARIOS

In their opening comments, the Natural Resources Defense Council (“NRDC”) and the Union of Concerned Scientists (“UCS”) assert that:

In its current form, the E3 model does not account for the effect of increased reliance on preferred resources on reducing natural gas prices. Instead, the E3 model assumes that natural gas prices are unchanged between the reference and the target cases, even though natural gas demand may be much lower in the target case. The assumption that natural gas prices will not be affected by substantially reduced demand is a significant oversight of the E3 model.¹⁰

SCE has reviewed the documents referenced by NRDC/UCS in their comments and acknowledges the potential for decreased natural gas demand within the electricity sector based upon two main factors:

1. Replacing old, less efficient simple-cycle peaker gas units with new, more efficient CHP/CC gas units will allow the same (or more) energy to be produced while burning less fuel; and
2. An increase in renewable energy and implemented energy efficiency measures will displace a proportionate share of energy from marginally priced natural gas units.

Without diminishing the validity of NRDC/UCS's concern, however, it is important to look at the other side of the coin and consider that another section within the CEC's 2007 Integrated Energy Policy Report includes a scenario describing how natural gas could be used as

⁹ The Western Power Trading Forum's (“WPTF”) opening comments note that because E3's GHG calculator was developed to model a load-based approach, it cannot quantify the benefits of alternative systems such as a source-based approach or a first seller approach as currently configured. WPTF Opening Comments at 9. SCE supports a first seller regulatory approach to satisfying the State's GHG abatement goals. Incorporating a first seller model into the GHG calculator would provide a more realistic assessment of a first seller approach. Because this calculator models a load-based cap, it does not include emissions costs in the dispatch price. In a first seller approach, the emissions cost would be included in the dispatch price.

¹⁰ NRDC/UCS Opening Comments at 17.

a complementary strategy to meet GHG emissions reductions.¹¹ This scenario and a subsequent recommendation discuss how the demand for natural gas could increase under a strategy to displace coal power plants in the Western Electricity Coordinating Council (“WECC”) and the eastern United States with natural gas fired power plants.¹²

Rather than initiating a potentially time consuming discussion on the appropriate fuel prices to use in PLEXOS for production cost/economic dispatch modeling purposes, SCE believes E3’s intent is to use their GHG calculator as a means to efficiently and quickly evaluate scenarios and analyze sensitivity cases, which of course should include changes in fuel prices. These analyses would help determine the feasibility of different emissions scenarios under a range of fuel prices while avoiding a prolonged process of determining a “correct” natural gas forecast.

IV.

E3’S TREATMENT OF WIND INTEGRATION COSTS SHOULD BE CLARIFIED

As SCE explained in its opening comments, E3 should clarify its treatment of wind integration costs. In particular, E3’s graphical display using wind penetration in % MW¹³ and then in % GWh¹⁴ should be revised for consistency. E3’s reference to 30,000 GWh of wind energy having a wind integration cost of \$275 million may suggest that 30,000 GWh is synonymous with 30% wind capacity penetration. However, 30,000 GWh is more closely associated with 20% wind capacity penetration using E3’s assumed control area size of 50,000 MW and wind capacity factor of 34%. The wind integration costs for 30% wind capacity for the 50,000 MW control area assumed by E3 would, using E3’s values, have an associated cost of over \$400 million. When calculated for a control area with a coincident peak of 70,000+ MW

¹¹ CEC 2007 Integrated Energy Policy Report at 241-42.

¹² *Id.*

¹³ E3’s CPUC GHG Modeling Stage 1 Documentation at 145, Fig. 5 (http://www.ethree.com/GHG/R0604009_Attachment_B_v2.pdf).

¹⁴ *Id.* at 146, Fig. 6.

(i.e., the CEC's projected demand for California beyond 2018),¹⁵ the values would be significantly higher. The tables below clarify the treatment of wind integration costs.

E3's Wind Integration Costs (Chapter 28)						
Back Calculated	Assumed	Back Calculated	Assumed	Assumed	Assumed	Calculated
Percent Penetration (%)	System Capacity (MW)	Wind Capacity (MW)	Capacity Factor (%)	Starting Point	Wind Energy (GWh)	Cost (\$/MWh)
				Wind Energy (GWh)		
6.7%	50,000	3,358	34%	10,000	3.13	\$ 31,300,000
13.4%	50,000	6,715	34%	20,000	6.26	\$ 125,200,000
20.1%	50,000	10,073	34%	30,000	9.39	\$ 281,700,000

E3 10,000 GWh of wind energy is implied to be equivalent to 10% MW penetration of wind capacity, which is incorrect

Implied Conclusion: Wind integration costs are \$30 Million for 10% penetration, \$125 Million for 20% penetration, and \$280 Million for 30% penetration

SCE's Wind Integration Costs using E3's Values and a Calculated Wind Energy for Assumed MW penetration value						
Assumed	Assumed	Calculated	Assumed	Calculated	Assumed	Calculated
Starting Point						Cost
Percent Penetration (%)	System Capacity (MW)	Wind Capacity (MW)	Capacity Factor (%)	Wind Energy (GWh)	(\$/MWh)	\$
10.0%	50,000	5,000	34%	14,892	3.13	\$ 46,611,960
20.0%	50,000	10,000	34%	29,784	6.26	\$ 186,447,840
30.0%	50,000	15,000	34%	44,676	9.39	\$ 419,507,640

Conclusion: Wind integration costs are \$45 Million for 10% penetration, \$185 Million for 20% penetration, and \$420 Million for 30% penetration

V.

IMPLEMENTATION OF A 33% RENEWABLES PORTFOLIO STANDARD

PRESENTS SIGNIFICANT CHALLENGES

NRDC/UCS's opening comments argue that "California should immediately adopt a 33% Renewables Portfolio Standard (RPS) to ensure the development of additional renewable resources to serve the state."¹⁶ NRDC/UCS assert that "[t]he CEC Intermittency Analysis Project (IAP) concludes the state's electricity system, if bolstered by transmission upgrades and

¹⁵ CEC 2007 Integrated Energy Policy Report at 45.

¹⁶ NRDC/UCS Opening Comments at 7.

prudent resource planning, can readily accommodate 33% renewables penetration with minor changes to system operation and infrastructure.”¹⁷

SCE has discussed the need for legislation in order to adopt a 33% RPS requirement and other challenges surrounding a 33% RPS in other forums and does not repeat that discussion here.¹⁸ SCE does note, however, that NRDC/UCS significantly understate the challenges of implementing a 33% RPS. SCE agrees with PG&E’s opening comments that major issues associated with expanded renewables procurement still need to be resolved.¹⁹

A recent California Independent System Operator (“CAISO”) study regarding the integration of renewable resources concludes that:

The good news is that this study shows the feasibility of maintaining reliable electric service with the expected level of intermittent renewable resources associated with the current 20 percent RPS, provided that existing generation remains available to provide back-up generation and essential reliability services. The cautionary news is the “provided” part of our conclusion. Regulatory actions under active consideration threaten the economic viability of much of this essential generation. Moreover, current regulatory policies assigning high on-peak availability factors to intermittent generation will eliminate the theoretical — but not the real — need for the essential generation currently provided by existing power plants, and regulators may be unwilling to support sufficient forward procurement of generation.²⁰

Furthermore, in discussing the CEC’s IAP, the CAISO states that “[i]t would be erroneous to conclude that there are no serious integration problems” with even a 20% RPS.²¹ Contrary to NRDC/UCS’s suggestion that the changes to system operation and infrastructure needed to accommodate a 33% will be “minor,” the CAISO notes that the IAP report concluded that “[m]ajor new transmission facilities and upgrades of existing transmission will be required

¹⁷ *Id.*

¹⁸ See, e.g., Southern California Edison Company’s 2006 Procurement Plan Volume 1B, R.06-02-013, at 74-88 (Dec. 11, 2006).

¹⁹ PG&E Opening Comments at 17-23.

²⁰ CAISO, Integration of Renewable Resources, Transmission and operating issues and recommendations for integrating renewable resources on the California ISO-controlled Grid, Letter from CEO (November 2007) (emphasis added) (available at <http://www.caiso.com/1ca5/1ca5a7a026270.pdf>).

²¹ *Id.* at 19.

for the 20% RPS and especially to accommodate the 33% RPS goal.”²² The CAISO also concludes that increasing the RPS from 20% to 33% could more than double integration costs and problems:

The variability of wind generation energy production from a small number of units is usually much less than the variability of system load changes. The system operator is accustomed to dealing with daily load forecast errors, changes in hourly load forecasts and the unpredictability of loads. As the amount of wind generation in an area increases, it will reach a point where its variability is greater than the variability of load. As wind generation further increases, the amount of variability will increase non-linearly. This study focused on the 20% RPS. An increase of the RPS to 33% could more than double the integration problems and costs.²³

SCE shares PG&E’s concern that the CPUC and the CEC adequately evaluate all of the challenges associated with GHG emissions reductions from incremental renewables.

VI.

CARBON CAPTURE AND SEQUESTRATION SHOULD BE CONSIDERED AS A GHG EMISSIONS REDUCTION OPTION

The Green Power Institute’s (“GPI”) opening comments state that until there is “a sound demonstration of the technical viability of carbon sequestration,” carbon capture and sequestration (“CCS”) “should not be considered as a real option for meeting greenhouse gas emissions reduction goals in any timeframe of interest to planners and regulators.”²⁴ SCE disagrees. SCE believes that CCS technology has the potential to reduce GHG emissions, and has submitted an application with the CPUC to perform a feasibility study of a clean hydrogen generation plant.²⁵ No environmental parties to that proceeding (which include Californians for Renewable Energy, The Utility Reform Network, and NRDC) claimed that CCS was not ripe for

²² *Id.* at 20.

²³ *Id.* at 14 (emphasis added).

²⁴ GPI Opening Comments at 4.

²⁵ A.07-05-020.

consideration.²⁶ The CPUC recently issued a proposed decision granting SCE's application.²⁷ Moreover, the National Energy Technology Laboratory (of the Department of Energy) projects that by 2012, it will have developed CCS technologies with 99% permanence.²⁸ CCS should not be excluded as an option for reducing emissions to meet the State's AB 32 goals.

VII.

E3 SHOULD PROVIDE MORE DETAILED DOCUMENTATION EXPLAINING ITS MODEL

SCE agrees with the sentiment expressed by several parties in their opening comments that more detailed E3 modeling documentation is needed in order to assess the underlying model.²⁹ It is difficult to build a meaningful scenario with the current documentation, and it would be useful to have examples of scenario build-outs documented by E3 to ease calculator usability. As explained in SCE's opening comments, E3 should provide a document which captures details on values and equations listed on tabs other than the "Main" tab on its GHG calculator. E3 should also provide the other documentation requested in SCE's opening comments.³⁰ In addition, SCE recommends that the CPUC conduct a workshop or seminar where E3 could explain how to use the GHG calculator. Such a workshop or seminar would make it easier for the parties to use and assess E3's model, and would also provide the parties with an additional opportunity to ask E3 questions about its modeling.

²⁶ NRDC/UCS support consideration of CCS as an option for meeting GHG emissions reduction goals in this proceeding. NRDC/UCS Opening Comments at 3-5.

²⁷ See Proposed Decision issued on Jan. 15, 2008 in A.07-05-020.

²⁸ See http://www.netl.doe.gov/technologies/carbon_seq/overview/images/CS%20Program%20Milestones.jpg.

²⁹ See, e.g., SCPPA Opening Comments at 12-13; SMUD Opening Comments at 6-7; GPI Opening Comments at 7; The Independent Energy Producers Association Opening Comments at 2-3.

³⁰ SCE Opening Comments at 6-7.

Respectfully submitted,

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APPENDIX A

Customer Cost of Load-Based Cap vs. First-Seller



November 7, 2007

Background

- Synapse Energy Economics, Inc. analyzed the differences between a Load-Based Cap and a Source-Based Cap and their corresponding economic impacts on the California electricity market. Bruce Biewald, president of Synapse, presented the findings at the CPUC/CEC Joint En Banc Hearing on August 21, 2007
- Synapse concluded that a “load side carbon cap is likely to cost California consumers significantly less than a supply side cap”, to the possible extent of \$5 billion annually
- However the assumptions used in the Synapse model are flawed and the results distort the economic impacts to customers under load-based and source-based caps
- Both PG&E and SCE have engaged Synapse to gain a better understanding of the model; Synapse has responded to the inquiries but PG&E and SCE both feel that deficiencies remain in the analysis

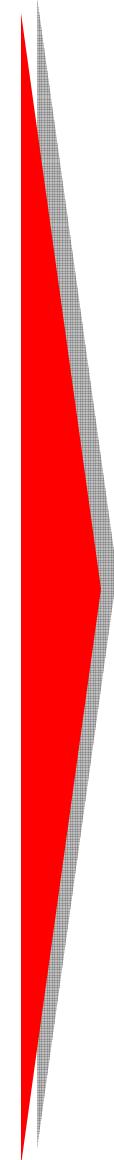


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Impacts of a Carbon Cap on Power Prices

- Under a First-Seller approach:
 - Costs of emissions are internalized by generators
 - Power prices will reflect the GHG attributes of the marginal generator
- Under a Load-Based Cap:
 - The marginal generator will set the market price for electricity that excludes CO₂ compliance costs
 - As the point of regulation, Load-Serving Entities' (LSEs) customers will have to pay the CO₂ compliance cost separately



Under a Load-Based Cap, clean generators will negotiate bi-laterally with many LSEs for contract prices that reflect the value of their “clean power”, including:

- The market price of electricity, and
- The CO₂ compliance costs LSEs' customers avoid by buying clean power



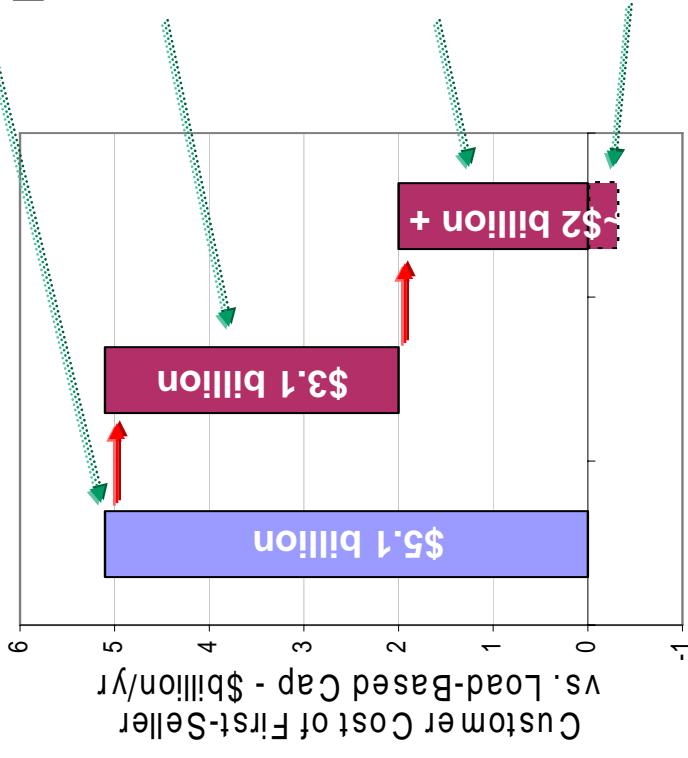
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Results

Synapse Energy greatly overstated the benefits of a Load-Based Cap

A “Benefit” of \$5.1 billion/year was presented by
Bruce Biewald at the En Banc



But, if you allocate allowances to Load-Serving Entities (LSEs) instead of Generators, this benefit is reduced by \$3.1 billion/year

And recognize that Clean Generators will negotiate higher prices with many LSEs to capture the economic value of their “clean power”

Thus, a Load-Based Cap will cost the same or more than First-Seller, depending on the default emission rate.

[The Synapse Energy presentation was delivered by Bruce Biewald at the CPUC/CERC en banc hearing on August 21, 2007. The presentation and spreadsheet are available at: <http://www.synapse-energy.com/>]

\$3.1 Billion Impact of Allowance Allocation on Customer Costs

- In Synapse's presentation, allocating allowances to generators rather than LSEs on behalf of their customers increases customer costs by \$3.1 billion/year.
- The point of regulation, however, should not alter the allocation of allowances.
- Synapse acknowledges that, under a generator-side cap, allowances can be allocated to generators or to LSEs.
- If you allocate allowances to Load-Serving Entities (LSEs) instead of generators, customer costs are reduced by \$3.1 billion/year



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~\$2 billion: Significant Flaws in the Synapse Model

1. Synapse model ignores economic dispatch:
 - After the CO₂ cost is internalized in Source-based scenario, Synapse indicates utilities will buy more high-cost Nat Gas electricity, even though Imp Coal remains cheaper.
2. The model ignores the heat rate curve for natural gas generation:
 - In the Load-Based Cap scenario, natural-gas-fired generation increases, but its marginal costs do not.
3. The model uses a “weighted market price”:
 - Instead of a market-clearing price, Synapse calculates a weighted average of each dispatchable category’s Generation times its “Marg Cost”.
4. The model lacks a market clearing price:
 - Each category of dispatchable generators, including imports, is paid that category’s “Marg Cost”, not a market-clearing price.
 - e.g. assumes hydro is paid \$55 and gas \$80, even though in reality in present and future short-term markets lower-emitting and higher-emitting generators receive same electricity price.



Utility Analysis: Customer Costs Are Similar Under Load-Based Cap and First Seller

- Overall electricity costs to customers are likely to be similar under Load-Based Cap and First-Seller, because Renewable Generators will bargain with many Load-Serving-Entities (LSEs) for full value, including LSEs' emission-compliance cost for High Emitters.

Assumptions	Merchant Generator	
Renewables	GasCC	High Emitter \$25/MWh \$10/MWh
Running Cost Emission Cost @ \$20/metric ton	\$50/MWh \$8/MWh	
Today's Market		
Wholesale-Market Price (set by GasCC, excluding Emission Cost)	\$50/MWh	\$50/MWh
First-Seller		
Wholesale-Market Price (set by GasCC, including Emission Cost)	\$58/MWh	\$58/MWh
Load-Based Cap		
Wholesale-Market Price (set by GasCC, excluding Emission Cost)	avoid wholesale market \$0/MWh	\$50/MWh or bilateral \$8/MWh
Additional Emission Cost paid by LSE		\$10/MWh
Total Cost to Ratepayers	\$58-\$60/MWh	\$58-\$60/MWh

Load-Based Cap: Renewables and GasCCs will bargain with many LSEs for highest contract price, including benefits of their lower CO₂ emissions relative to High Emitter.

Load-Based Cap: Depending on level and application of default emission rate, either leakage may occur or LSEs may pay more for High Emitters and Renewables.



Appendix

- Flaws in Synapse Energy's model
- Impact of default emission rate on economic impacts and leakage



Flaws in Synapse Energy's Analysis (1)

- The Synapse analysis ignores economic dispatch
- Synapse: After the CO₂ cost is internalized, Synapse indicates utilities will buy more high-cost Nat Gas electricity, even though Imp Coal remains cheaper
- Reality: Utilities will procure least-cost energy, including internalized CO₂ costs

Category	Type	Marg Cost (\$/MWh)	CO ₂ Cost (\$/MWh)	Effect	Adj Price (\$/MWh)	Adj Gen (GWh)	Gen Costs (M\$)	Economic Dispatch		
								Generation (GWh)	Gen Costs (M\$)	Adj Price (\$/MWh)
Dispatchable	Nat Gas	93,562	80.0	16.6	96.6	105,931	10,232	93,562	96.6	9,037
	Imp Hydro/Nuclear	19,016	55.0	0.0	55.0	19,016	1,046	19,016	55.0	1,046
	Imp Gas	19,016	80.0	16.6	96.6	19,007	1,837	19,016	96.6	1,838
	Imp Coal	38,033	45.0	31.2	76.2	27,118	2,066	38,033	76.2	2,898
	Oil & Other	4,611	125.2	36.9	162.1	4,300	697	4,611	162.1	748
Coal		2,145	30.0	43.8	76.8	1,012	78	2,145	76.8	165
Fixed	Renewables	23,648	55.0	0.0	55.0	23,648	1,301	23,648	55.0	1,301
	Hydro	39,632	30.0	0.0	30.0	39,632	1,189	39,632	30.0	1,189
	Nuclear	36,155	40.0	0.0	40.0	36,155	1,446	36,155	40.0	1,446
		275,819			275,819	19,892	275,819			19,667

Electricity from gas-fired plants costs more than from coal, but demand for gas-based electricity increases. This violates economic dispatch.



Flaws in Synapse Energy's Analysis (2)

- The Synapse model ignores increasing marginal costs of natural gas generation
- Synapse: In the Load-Based Cap scenario natural gas generation increases, but marginal costs do not
- Reality: As natural gas generation increases, less efficient units will come online, increasing the marginal cost (of natural gas generation)

Load-Based Cap Scenario

Category	Type	Capacity (MM)	Generation (GWh)	Marg Cost (\$/MMWh)	CO2 Rate (Tons/MMWh)	Adj Price (\$/MMWh)	Rel Price Change	Adj Gen (GWh)	CO2 Emis (kTons)	Gen Costs (\$)
Dispatchable	Nat Gas	36,700	93,562	80.0	0.553	16.6	80.0	105,931	58,577	8,474
	Imp Hydro/Nuclear	4,000	19,016	55.0	0	0.0	55.0	19,016	0	1,046
	Imp P Gas	4,000	19,016	80.0	0.555	16.6	80.0	19,007	10,541	1,521
	Imp Coal	8,000	38,033	45.0	1.040	31.2	45.0	27,118	28,203	1,220
	Oil & Other	1,031	4,611	125.2	1.230	36.9	125.2	4,300	5,289	538
Coal		389	2,145	30.0	1.560	46.8	30.0	1,012	1,578	30
Fixed	Renewables	5,479	23,648	55.0	0	0.0	55.0	23,648	0	1,301
	Hydro	10,088	39,632	30.0	0	0.0	30.0	39,632	0	1,189
	Nuclear	4,324	36,155	40.0	0	0.0	40.0	36,155	0	1,446
		74,011	275,819					275,819	104,188	16,766

Original Demand

Adjusted Demand has been copied from Source-Based scenario, but...

... Adjusted Prices do not change.

Original Prices

Flaws in Synapse Energy's Analysis (3)

- Instead of a market-clearing price, Synapse calculates a “weighted market price” as a weighted average of each dispatchable category’s Generation times its “Marg Cost”.

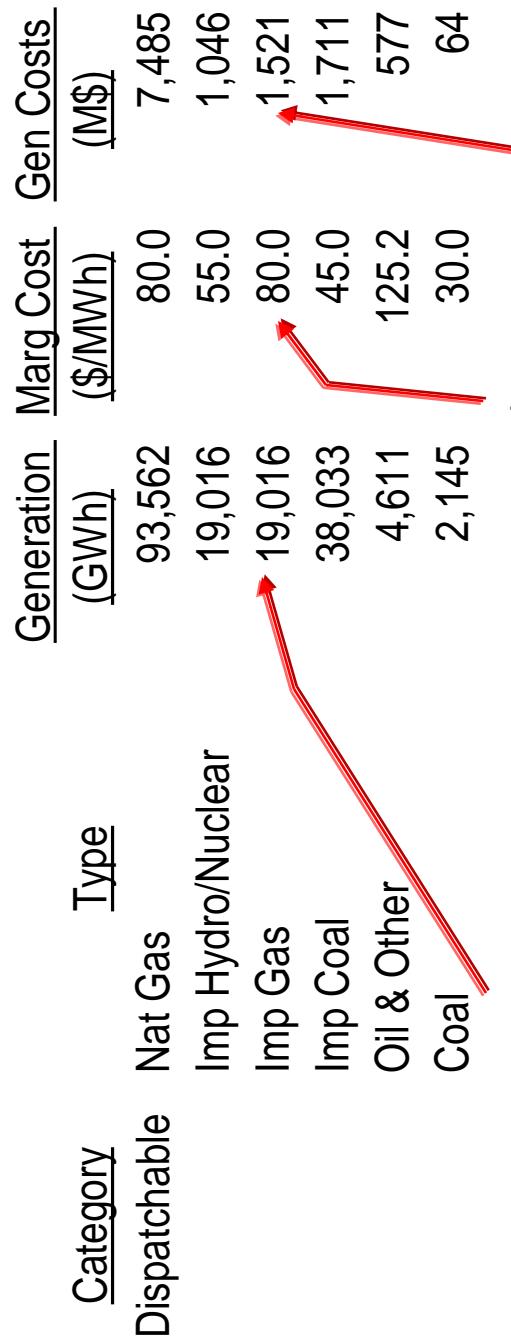
<u>Category</u>	<u>Type</u>	<u>Generation (GWh)</u>	<u>Marg Cost (\$/MWh)</u>
Dispatchable	Nat Gas	93,562	80.0
	Imp Hydro/Nuclear	19,016	55.0
	Imp Gas	19,016	80.0
	Imp Coal	38,033	45.0
	Oil & Other	4,611	125.2
	Coal	2,145	30.0
Weighted Market Price (\$/MWh)			70.33



[“Weighted Market Price” formula in Synapse worksheet “Near Term” cell Q26.]

Flaws in Synapse Energy's Analysis (4)

- Synapse analysis lacks a market-clearing price
- Synapse: Each category of dispatchable generators, including imports, is paid that category's "Marg Cost", not a market-clearing price.
- Reality: Low-emitting and high-emitting generators receive the same electricity price, both in today's WECC spot markets and in the future Integrated Forward Markets of the California Independent System Operator.



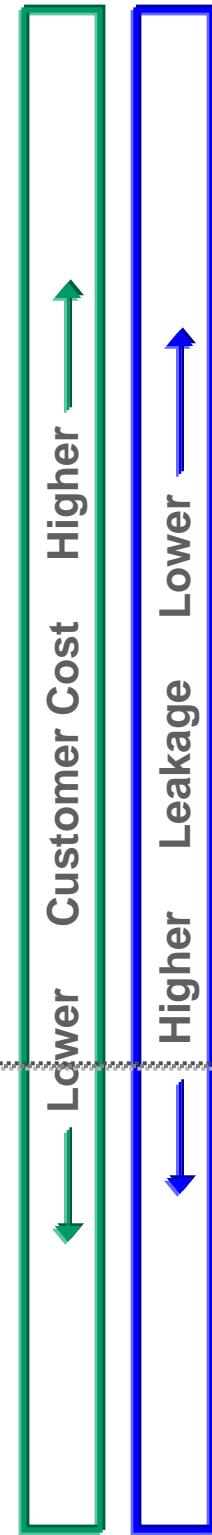
$$\frac{\text{Imp Gas Generation (19,016 GWh)} * \text{Imp Gas Marg Cost (\$80/MWh)}}{\text{Imp Gas Gen Costs (\$1,521M)}} =$$



[Table copied from Synapse worksheet "Near Term" rows 25-31.]

Impact of Default Emission Rate

- A default emission rate is needed for “unspecified” purchases (i.e., cannot be traced to a specific generator)
- Under a Load-Based Cap, both imports and in-state purchases can come from unspecified sources
- Under First-Seller only imports can come from unspecified resources
- A high default rate will increase customer costs: Low-emitters will have greater value to LSEs and will demand higher prices in negotiations
- A low default rate will increase leakage: More emissions from high-emitters will be lost



Policy Choice: Move left or right?



CERTIFICATE OF SERVICE

I hereby certify that, pursuant to the Commission's Rules of Practice and Procedure, I have this day served a true copy of REPLY COMMENTS OF SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E) ON MODELING-RELATED ISSUES on all parties identified on the attached service list(s). Service was effected by one or more means indicated below:

Transmitting the copies via e-mail to all parties who have provided an e-mail address. First class mail will be used if electronic service cannot be effectuated.

Executed this **18th of January 2008**, at Rosemead, California.

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