

California Earthquake Authority (CEA)

Analysis of Ideas for Improving CEA's Financial Condition

Background:

The CEA's authority to assess its participating insurers in the 1st Industry Assessment Layer ("1st IAL") expires by law ("sunset") on December 1, 2008. The following are the ideas to improve the CEA's financial structure that met staff criteria for further analysis.

- Determine the optimal amount of CEA claim-paying capacity
- Keep the 1st Industry Assessment Layer (IAL) or modify the sunset provision
- Allow CEA to Purchase Reinsurance from the Participating Insurers

The final section of the paper is a comparison of the most viable alternate financial structures.

Analysis:

I. Determine the Optimal Amount of CEA Claim-Paying Capacity

Other Metrics Used to Determine Claim-Paying Capacity

In the past, the Board has accepted and used staff-developed metrics to determine the maximum claim-paying capacity for the CEA financial structure. The metric used to determine the CEA's maximum claim-paying capacity is, "the capacity that provides a 99.9% probability that the CEA financial structure will have sufficient claim-paying capacity to pay all claims that might arise from an earthquake, or series of earthquakes, during a one-year period." This translates into a one in 1000 year loss event. While California is unique, comparing the CEA's financial benchmarks to other prominent national catastrophe programs gives an idea of the methodology used by other catastrophe programs in determining the appropriate claim-paying capacity. The following is a summary of the financial structure characteristics and claim-paying capacity amounts used by other catastrophe programs which was compiled from information publicly obtained through the internet:

Citizens Property Insurance Corporation (wind)		
Personal Lines	\$3.5 billion	1-in-250 year event
Commercial Line	\$2.0 billion	1-in-100 year event
High Risk	\$7.2 billion	1-in-100 year event
Alabama Insurance Underwriting Assoc. (wind)	\$50 million	1-in-129 year event
Florida Hurricane Cat Fund (wind)	\$15 billion	1-in-46.5 year event
Georgia Underwriting Assoc. (wind)	\$65 million	1-in-250 year event
Texas Windstorm Insurance Assoc. (wind)	\$1.3 billion	1-in-100 year event

Internationally, Switzerland's terrorism pool buys claim-paying capacity to cover an event with a return period from 250 years up to approximately 800 years. In Japan, they utilize a "Solvency Margin" based on major catastrophes. For example, the per-occurrence measure for earthquake is the Great Kanto Earthquake scale (1-in-250), and the per-occurrence measure for typhoon is Typhoon Vera in 1959 (1-in-70).

Although the claim-paying capacity of the catastrophe programs above are not unilaterally comparable to the CEA's financial structures, the data shows that the CEA's amount of claim-paying capacity is larger than the catastrophe programs mentioned above and is at least four times larger than all but one (Switzerland).

State-Wide Estimated Losses

To put the CEA's claim-paying capacity into perspective, *Attachment D-1* presents a list of hypothetical earthquakes (at their fault's maximum rupture force) applied to the CEA's policyholder portfolio as of December 31, 2004. Using the recently revised EQECAT earthquake model, the results show the CEA's probable maximum loss (PML) and the estimated total California residential and commercial property loss (not including infrastructure).

The table shows that although the CEA's PML for a 6.95 magnitude earthquake on the Northridge fault (which represents the largest rupture that could occur on this fault versus the 6.7 magnitude earthquake in January 1994) would only be \$4.89 billion, the total impact on the state of California would be approximately \$113 billion. Other earthquakes had a similar result in that state-wide damage would be approximately 100 times greater than the probable maximum loss suffered by the CEA.



Although these results do not demonstrate that the CEA is either over-funded or under-funded, they do show that if the CEA were to experience an earthquake large enough to deplete its claim-paying capacity at a 99.9% probability, the state's citizens, local government and emergency officials, and private insurers would be facing a cataclysmic situation.

Claim-Paying Pattern

Another item to consider when determining claim-paying capacity is the CEA claim-payout pattern. The payout pattern is the estimated time it takes to pay 100% of the claims for an event.

Attachment D-2 shows the claim-payout pattern following the Northridge Earthquake for three CEA participating insurers and for companies that write reinsurance business and for the CEA's projected payout pattern for an event similar to Northridge in January 1994. The attachment shows that 90% of the Northridge claims would be paid by the CEA over the course of approximately 1.5 years (18 months). During that time period, the CEA would still be collecting premiums. Assuming the CEA adds \$250 million to its surplus each year, the CEA would have increased surplus by \$375 million during the time

it took to pay the majority of the claims. The CEA's DFA model assumes all claims are paid at mid-year, and that no future earnings contribute to the CEA's surplus. Therefore, when using the DFA model to determine the optimal claim-paying capacity, the CEA should take into account its earnings during the payout period. The CEA is considering a change to the DFA model to represent a more realistic claim-payout pattern similar to *Attachment D-2*. However, the CEA's payout pattern is slightly more aggressive due to the CEA's faster projected claims payments.

Rating Agencies

Raising or lowering the CEA's claim-paying capacity affects the financial strength that rating agencies assign, or in the future, will assign a financial strength rating to the CEA. Currently, the CEA is assigned an A- (excellent) rating from A.M. Best ("Best"), the nation's oldest most authoritative insurance company rating agency. Although Best uses more than 100 key financial ratios in their analysis, Best's Capital Adequacy Ratio (BCAR) is widely regarded as the most significant quantitative test in determining a company's rating. The BCAR ratio compares a company's adjusted surplus with its net required capital. A higher ratio indicates stronger capitalization, therefore a stronger rating score.

For earthquake exposure, BCAR typically assumes a company experiences a probable maximum loss (PML) of a 1-in-250 year earthquake. Best currently uses a 1-in-250 year followed by a 1-in-90 year event to stress test the adequacy of the CEA claims paying capacity. A BCAR score should be above the 130 score set by A.M. Best for an A- rating (see table below).

The CEA's BCAR score for the 2004 rating review was 137. Although the CEA's claim-paying capacity was sufficient to receive a re-confirmed A- rating in 2004, increasing or decreasing the level of claim-paying capacity could have a direct impact on the CEA's future ratings.

Minimum BCAR Levels	
Implied Balance Sheet Strength Rating	Minimum BCAR
Secure:	
A++	175
A+	160
A	145
A-	130
B++	115
B+	100
Vulnerable:	
B	90
B-	80
C++	70
C+	60
C	50
C-	40
D	0

Research by an independent financial-analysis team that specializes in rating-agency reviews evaluated the CEA to determine how changes in the CEA's level of claim-paying capacity would affect the CEA's Best rating. The results of their evaluation are summarized below:

- The BCAR ratio currently only evaluates the CEA's claim-paying capacity for a 1-in-250 year event followed by a 1-in-90 year event. Therefore, there is no quantitative benefit in buying more capacity above those levels since the BCAR score will not increase as a result of the additional capacity. However, the additional capacity should provide a material qualitative benefit as Best reviews all the factors that impact the CEA's rating assignment.
- Although the CEA's BCAR of 137 was sufficient to receive an A- rating, in the future Best likely will require the CEA to maintain a BCAR ratio materially above its current published minimum.
- Best is still evaluating how they will stress test the CEA's BCAR ratio. Possible scenarios include increasing the return period for the second event, materially increasing the return period for the first event, or a combination of the two.

The CEA is currently undergoing the annual rate review with Best and did not know the agency's capital adequacy requirements to maintain at least an A- rating as of the date of this paper. Therefore, staff does not recommend changing the claim-paying capacity levels until the rating review is complete.

DFA Analysis of Multiple Claim-paying Capacity Levels

To determine the effect that different levels of claim-paying capacity would have on the CEA's financial structure, staff ran DFA analyses on a projected 2009 financial structure at four different claim-paying capacity levels. The financial structure assumes the 1st IAL sunsets in December 2008 and includes a \$300 million revenue bond and a \$200 million catastrophe bond (assuming that prior to 2008 the CEA revisits the issuance of a catastrophe bond). The structure also assumes that the only variable in claim-paying capacity is due to differing amounts of reinsurance. *Attachment D-3* is a graphical comparison of the financial structure at the following four different levels of claim-paying capacity:

- Level 1 - Pre-event capacity 1-in-1000 year event. Post-event capacity 1-in-500 year event.
- Level 2 - Pre-event capacity 1-in-750 year event. Post-event capacity 1-in-500 year event.
- Level 3 - Pre-event capacity 1-in-500 year event. Post-event capacity 1-in-500 year event.
- Level 4 - Pre-event capacity 1-in-250 year event. Post-event capacity 1-in-250 year event.

Staff chose to use 250/250 for the 4th level because establishing more capacity for the second event than for the first event would have been detrimental to the CEA's financial structure in every metric for that DFA run.

Attachments D-4, D-5, D-6, and D-7 are the DFA analyses for each capacity level. *Attachment D-8* shows a graphical comparison of the DFA metrics for the four different levels. The CEA can make the following observations about the comparison:

- The metrics are significantly lower for the 250/250 capacity level than all three of the other levels.
- Although the metrics are slightly different for the 1000/500, 750/500, and 500/500 levels, all three levels are well within the CEA's acceptable limits for default rate, annual loss rate, and cumulative survival rate. In addition, although all three levels exceed the 1% maximum expected policyholder deficit (EPD), one financial structure is not clearly better than the others.

Given the above observation, prudently lowering the CEA's level of claim-paying from a 1-in-1000 year event appears to be a viable option. However, staff does not recommend reducing the CEA's capacity below a 99.9% probability of non-exceedence until the A.M. Best rating review mentioned above is complete.

II. Keep the 1st Industry Assessment Layer (IAL) or Modify the Sunset Provision

Other financial structure ideas proposed in the public meetings were to keep the 1st IAL or modify the existing sunset. This section will address the following two options for modifying the 1st IAL sunset and will compare the two options to the CEA's base financial structure.

Option 1 – Place the 1st IAL on top of the 2nd IAL

This alternative financial structure moves the entire 1st IAL up in the CEA's financial structure and places it directly on top of the 2nd IAL as of December 1, 2008. Although this option does not provide any additional claim-paying capacity below reinsurance or other financial instruments, adding (or combining) the 1st IAL with the 2nd IAL contributes to the total amount of claim-paying capacity the CEA would need to maintain a 99.9% probability (or a 1 in 1000 year event). *Attachment D-9* compares the DFA metrics for the CEA's base structure (*Attachment D-10* - assumes the 1st IAL sunsets in December 2008 and replaces the layer with reinsurance) with a financial structure that places the 1st IAL on top of the 2nd IAL (*Attachment D-11*) and its corresponding metrics (*Attachment D-12*). The comparison is summarized as follows:

- Although combining the two industry layers has a higher cost to participating insurers, the 1st IAL is so high in the CEA's financial structure that its attachment point is at a 99.7% level.
- Moving the 1st IAL above the 2nd IAL would drop the 2nd layer's attachment point from a 99.78% annual probability of accessing to a 99.37% annual probability of accessing, which is midway through the existing 1st IAL.
- The average amount of reinsurance capacity for the structure with the combined IAL layers is \$1.038 million lower than the average reinsurance capacity required for the base structure. This results in an average drop in total financing costs of \$68 million per year and an 11.7% decrease in both average cost to policyholders and average rate per \$1,000.
- Combining the two industry assessment layers at the top of the CEA's financial structure significantly improves all other DFA metrics including keeping the expected policyholder deficit under 1.00% for the entire 20-year DFA run.

Option 2 - Gradually Phase Out the 1st IAL or Replace it as CEA Capital Grows

An alternative to keeping the entire first IAL after 2008 is to gradually phase out the first IAL or replace it as capital grows. Gradually phasing out the 1st IAL would consist of reducing the 1st IAL by a specific dollar amount over a stated period of time, for example, 10% of the layer for 10 years. On the other hand, the 1st IAL could be replaced by a corresponding increase in the CEA's capital. For example, the 1st IAL could decrease \$1 for every \$1 increase in CEA capital.

The question of whether or not rolling off the 1st IAL is beneficial or detrimental to the CEA financial structure is a function of the roll-off period. Recent DFA analyses have shown the CEA's financial structure is stronger with the 1st IAL than without it. Therefore, if the 1st IAL rolls off faster than the CEA builds capital, the CEA will have to purchase additional risk-transfer products to maintain the same level of claim-paying capacity, resulting in additional financing costs, thus causing the roll-off to be detrimental to the CEA's financial structure. The reverse is also true -- if the 1st IAL rolls off slower than the CEA builds capital, the CEA's financial structure would strengthen.

To determine the effect of gradually phasing out the 1st IAL, the CEA performed a DFA analysis comparing financial strengths of the CEA's base financial structure (see *Attachment D-10* above) with a structure that allows a \$1 decrease in the 1st IAL for every \$1 increase to the CEA's capital after 2008 (*Attachment D-13*) and its corresponding metrics (*Attachment D-14*). The DFA metrics are graphically compared in *Attachment D-15* and are summarized below:

- Although the average cost to policyholders and the average rate per \$1,000 is initially much lower when the 1st IAL gradually rolls off, the average cost and the average rate for both structures start to converge near the end of the 20-year DFA run.
- The annual loss rate, cumulative survival rate, expected policyholder deficit, and the default rate metrics are all better for the structure that gradually rolls off the 1st IAL.
- When the 1st IAL rolls off, the expected policyholder deficit metric only exceeds 1% in years 2015 and 2021, and only by 0.013% and 0.012%, respectively.

Attachment D-16 compares both the alternative financial structures above (option 1- combining the 1st IAL with the 2nd IAL, and option 2- rolling off the 1st IAL as CEA capital grows) with each other and with the CEA's base structure. Staff made the following observations:

1. The financial structures that retain all or a portion of the 1st IAL, either by moving it to a different location in the financial structure (option 1) or by gradually rolling it off (option 2), perform better in the DFA analysis than the structure which loses the 1st IAL and replaces it with reinsurance (CEA base structure).
2. Both alternative structures (option 1 and option 2) have significantly lower average rates per \$1,000 and average costs to policyholders than the CEA's base structure.
3. Of the three structures, the structure in which the 1st IAL rolls off (option 2) has the lowest average rate per \$1,000 and the lowest average cost to policyholders from 2009 through 2016. However, the structure that combines the two IALs (option 1) has the lowest average rate per \$1,000 and average cost to policyholders from 2017 through 2025. This phenomenon occurs because of the following reasons:

- a. Option 2 retains the 1st IAL at a low attachment point during the first years of the DFA run. The low attachment point keeps the reinsurance layers higher in the financial structure resulting in decreased reinsurance costs. On the other hand, moving the 1st IAL above the 2nd IAL causes the attachment point for the reinsurance layers to drop resulting in increased reinsurance costs. Since reinsurance cost is the single largest factor in the CEA's rates, if reinsurance costs rise, the cost to the policyholder rises.
 - b. For option 2, as CEA capital grows, the 1st IAL shrinks. In order to maintain claim-paying capacity at a 1 in 1000 year event, the CEA must continue to buy approximately the same amount of reinsurance year after year. In contrast, as CEA capital grows in option 1, the 1st IAL amount remains unchanged, albeit higher in the financial structure. Therefore, to maintain capacity at a 1 in 1000 year event, the CEA may reduce the amount of reinsurance by the corresponding amount of capital growth, thereby reducing reinsurance costs year after year.
 - c. The cost savings from having the 1st IAL lower in the financial structure (option 2) decline as the layer rolls off until the benefits are less than the cost savings from retaining the entire 1st IAL at a higher level in the financial structure (option 1). Total financing costs for the two options intersect at about halfway through the 20-year DFA analysis run.
4. The industry capital cost and total costs metrics are significantly higher for the two structures that maintain or retain a portion the 1st IAL than they are for the CEA's base structure.

III. Authorize CEA to Purchase Reinsurance from the Participating Insurers

Another alternative presented in the public meetings was for the CEA to compensate the participating insurers for an amount corresponding to the expiring 1st IAL. However, purchasing a risk transfer layer from the participating insurers would most likely be considered a reinsurance contract. This option was not pursued due to hurdles surrounding the participating insurers' selling reinsurance and the legal implications the transaction could present. In addition, even if a participating insurer were allowed to sell reinsurance to the CEA, if the price were not discounted, the CEA's financial structure would be no stronger than if the CEA replaced the 1st IAL with reinsurance in the open market.

IV. Comparison of the Most Viable Alternative Financial Structures

After analyzing the alternative financial structures discussed in this paper and the papers presented to the Board on November 24, 2005, staff chose the viable structures for further analysis. The criteria for a viable financial structure were as follows:

1. The financial structure's DFA metrics had to be within the CEA's maximum limits for default rate, annual loss rate, and expected policyholder deficit. (An exception was made for one of the structures because the expected policyholder deficit only slightly rose above 1% and only in 2 of the 20 DFA years.)
2. The financial structure metrics had to be as good as or better than the CEA's base structure metrics during the 20-year DFA run.

To determine the relative strength of the alternative financial structures, the CEA performed a DFA analysis comparing them with each other. The three structures in the DFA analysis were as follows:

- a. The financial structure that placed the 1st IAL on top of the 2nd IAL.
- b. The financial structure that rolled off the 1st IAL as CEA capital grew.
- c. The CEA's base structure with an additional \$500 million capacity from post-event bonds backed by broad-based assessments.

In addition, the analysis included the CEA's base structure since it is the mostly likely financial structure the CEA would use after 2008 absent any legislative or regulatory changes to the CEA statute, and the financial structure that retained the 1st IAL after 2008 (presented in the April 2005 Board meeting). The results of the DFA analysis are presented in *Attachment D-17* and are summarized as follows:

Cumulative Survival Rate

- a. The structure that placed the 1st IAL on top of the 2nd IAL had the highest survival rate throughout the DFA analysis. This is because it maintains both industry assessment layers to a higher probability of accessing and the layers are available for a cataclysmic event. The majority – 80% of the CEA losses are for events that do not reach the level of the 2nd IAL. Currently the 1st IAL resides in the financial structure at a level where the majority of losses would access the layer. Over time the 1st IAL is eroded to zero.
- b. The CEA's base structure had the lowest survival rate throughout the analysis.
- c. The survival rates for the structure that rolled off the 1st IAL and the CEA's base structure with post-event bonds were similar throughout the DFA analysis and almost identical at 2025.

Default Rate

The structure that placed the 1st IAL on top of the 2nd IAL had the lowest default rate and the CEA's base structure had the highest default rate. However, the default rates for all the structures were within acceptable limits.

Annual Loss Rate

The annual loss rate for all the structures were relatively similar and well within acceptable limits.

Expected Policyholder Deficit

- a. All structures except the CEA base structure were very close to or below 1.0% throughout the 20-year DFA run.
- b. All structures experienced a large increase in EPD in 2009 except the structure that placed the 1st IAL on top of the 2nd IAL.
- c. The structure that placed the 1st IAL on top of the 2nd IAL had the lowest EPD through the year 2020.

Average Cost to Policyholders and Average Rate per \$1,000

- a. All structures required a large premium increase in 2009 except for the two structures that retained all or part of the 1st IAL at its current level in the CEA's financial structure.
- b. Although the structure that places the 1st IAL on top of the 2nd IAL required a rate increase in excess of 20% initially, the cost to policyholders and the rate per \$1,000 decreased quickly and by 2016 were lower than the cost and rate for the structure that gradually rolled off the 1st IAL.
- c. The structure that retained the 1st IAL at its current level after 2008 had the lowest cost to policyholders and the lowest rate per \$1,000 throughout the 20-year DFA run.

Industry Capital Cost

The financial structure rankings for the industry capital costs metric were the inverse of the structure rankings for cost to policyholder and rate per \$1,000 metrics. In other words, the structures that cost less to the policyholders cost more for the participating insurers.

Average Ending Capacity

- a. The average ending capacity for the five structures significantly diverged in the year 2009.
- b. The three structures that maintained part or all of the 1st IAL had more capacity at the end of 2009 than the two structures that lost the 1st IAL.
- c. Only the structure that placed the 1st IAL on top of the 2nd IAL had more ending capacity in 2009 than in 2008.
- d. Although the CEA base structure with the additional post-event bonds ranked 4th in 2009, by the year 2013 its capacity was equal to or greater than the ending capacity for the structure that gradually rolled off the 1st IAL.
- e. By the end of the 20-year DFA run, the average ending capacity metric for all structures converged to within approximately \$500 million.

Available Capital

Available capital grew at relatively the same rate throughout the 20-year DFA run with the structure having the most capital never having over \$450 million more than the structure with the least capital.

Average Annual Written Premium and Reinsurance Capacity

The metrics for the average annual written premium and the ending reinsurance capacity behaved similar to the metrics for average cost to policyholders and average rate per \$1,000 because of the high correlation between reinsurance costs, policyholder cost and written premium. Financial structures that retained the 1st IAL performed better in these metrics than the structures that lost the 1st IAL.

The observations from the DFA analysis as well as the research from the financial structure white papers reveal that although the CEA's financial structure is clearly stronger if the 1st Industry Assessment Layer remains after 2008, alternative financial structures that modify the sunset provision or replace the layer with little or no cost to policyholder (such as post-event bonds backed by broad-based assessments) can provide the needed claim-paying capacity within the CEA's acceptable DFA metric limits. However, each alternative financial structure that strengthen the CEA required a legislative or regulatory change.

Conclusion:

Use of Broad-Based Assessments

Post-event bonds backed by broad-based assessments would provide a financial benefit to the CEA in two ways.

- First, the post-event bonds would strengthen the CEA's financial structure. The reason they contribute to the CEA's financial strength is because they add claim-paying capacity at little or no cost to the CEA.
- Second, backing the bonds with broad-based assessments improve the CEA's ability to collateralize and sell bonds in the capital market.

Place the CEA's Capital 'Higher' in the Financial Structure

Staff observed that moving a portion of the CEA's current available capital higher in the financial structure weakened the CEA's financial structure, while moving future available capital (from policy premiums) higher in the financial structure (by issuing revenue bonds and restricting bond proceeds to pay claims) strengthened the CEA's financial structure.

The main difference between the two strategies was the cost of reinsurance.

- When available capital moved above the reinsurance layers, the reinsurance attachment point dropped, resulting in increased prices that more than offset the benefits of retaining capital for a second event.
- Repaying debt with future premiums, however, allows the reinsurance layers to stay at their existing attachment points and prices.

Determine the Optimal Amount of CEA Claim-paying Capacity

DFA analyses suggest that prudently lowering the CEA's level of claim-paying from a 99.9% annual probability of accessing appears to be a viable option. However, staff does not recommend reducing the CEA's capacity below a 99.9% annual probability of accessing until the CEA receives the 2005 A.M. Best rating review.

Keep the 1st IAL or modify the sunset

The financial structures that retain all or a portion of the 1st IAL, either by moving it to a different location in the financial structure or by gradually rolling it off, perform better in the DFA analysis than the structures which lose the 1st IAL.

Preserving the 1st IAL by moving it on top of the 2nd IAL improves the CEA's financial strength. In addition, preserving both IALs reduces the amount of reinsurance the CEA needs to buy, which in turn reduces policyholder costs. Lastly, moving the 1st IAL above the 2nd IAL lowers the attachment point for the 2nd IAL, however the attachment point remains relatively high at a 99.37% annual probability of accessing.

The alternative structure in which the 1st IAL rolls off improves the CEA's financial strength as well and has the lowest policyholder cost during the first years of its implementation. However, as the 1st IAL gradually rolls off, the policyholder costs steadily increase as compared to the structure in which the 1st IAL sits on top of the 2nd IAL.