



California ISO
Your Link to Power

California ISO Straw Proposal

Congestion Revenue Rights

Credit Policy

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CAISO Straw Proposal for CRR Credit Policy

Introduction

The CAISO has held a series of stakeholder meetings and posted white papers and initial policy proposal on CRR credit requirements.¹ Since then, the CAISO has received comments from stakeholders and conducted further studies. This paper discusses the latest changes and expansions to the previously posted policy proposal. It also presents some numerical examples to illustrate the methodologies used to determine credit requirements for holding CRRs.

CAISO Proposals

There are two types of credit requirements. One is the credit required for obtaining CRRs through the CAISO CRR allocation and auction processes. The other is the credit required for holding CRRs.

I. CRR Allocation Credit Requirement

The CRRs distributed to LSEs through allocation process are free of charge. There is no credit deposit required for the LSEs to participate in the CRR allocation process.

II. CRR Auction Credit Requirement

There will be pre-auction credit requirements for participating in the CAISO CRR auction process. The amounts of credit required depend on the CRRs the participants intend to bid for. The following are the policies proposed.

1. Bidders will post credit prior to the auction in order to bid for positively priced CRRs. The credit has to be sufficient to cover the bid (bid price times quantity). Bids lacking sufficient credit coverage will not be included in the auction.

¹ CRR stakeholder meeting: 4/3/07: <http://www.caiso.com/1bb5/1bb5875027a50.pdf>
CRR Conference call: 3/27/07: <http://www.caiso.com/1bad/1badda6459b00.pdf>
Posting of LECG's revised draft: 3/20/07: <http://www.caiso.com/1ba7/1ba788da74450.pdf>
Stakeholder Meeting Presentation on 2/27/07: <http://www.caiso.com/1b92/1b928c9e2d2a0.pdf>
Posting of LECG white paper: 2/21/07: <http://www.caiso.com/1b8c/1b8cdb4c74ab0.pdf>

2. There will not be a pre-auction credit margin. (i.e. during the auction, only the cost of the bids for positive CRRs, without an additional margin, will be counted against the bidder's maximum credit limit for the CRR auction)
3. Once a CRR holder has paid for all CRRs it purchased in the auction, the CRR holder's credit coverage in excess of that needed to hold the purchased CRRs will be released. The valuation of the CRRs used in this determination will include a margin.
4. There will be no pre-auction credit requirement for participating in the auction for negatively priced CRRs.
5. No payments will be made to the CRR holder for the purchase of negatively priced CRRs until the credit coverage required (including a margin) for holding the CRRs is in place. Failing to maintain adequate credit coverage is considered a default and is subject to penalties described under the compliance policies.
6. CRRs will be paid for at the conclusion of the auction.

III. Credit Requirements for Holding CRRs

Entities holding CRRs may be required to post credit coverage for their potential liability for payments associated with the CRRs they hold. For CRRs that are negatively priced in the auction, the required coverage will be equal to the absolute value of the price of the CRR in the auction, plus a credit coverage margin. For CRRs that are positively priced in the auction, credit coverage will be required only to the extent that the credit coverage margin for that CRR exceeds the CRR's price in the auction. CRRs with positive auction prices in excess of the credit coverage margin will provide credit coverage for other CRRs held by the same entity.

The credit requirements are determined according to the following policies:

1. Credit coverage is required to hold CRRs, regardless how the CRRs are obtained (through allocation or auction).
2. Credit requirement is determined for the whole CRR portfolio of each holder. The excess credits from CRRs with high positive expected value can offset up to the same amount of the credit requirements of other CRRs in the same portfolio. This may reduce total credit requirements for some CRR holders. The downside is that it

increases the financial risk if the CRRs with excess credits have shorter terms than the CRRs requiring credit coverage. In such cases, when the positive CRRs expire, the CRR holder would be required to post/maintain adequate credit coverage for the negative CRR.

The other option is to assess credit requirement of each individual CRR separately, rather than for the whole portfolio of a holder. Credit offset is not allowed within a CRR portfolio with this approach. It may increase total credit requirements for some CRR holders, but it may simplify the process of assessing credit requirements and reduce financial risk caused by default of certain CRR holders. The methodologies and some numerical examples of this approach are discussed in the Appendix of this paper.

3. Credit margin and credit requirement

The credit requirement of a CRR consists of two components, the expected value of the CRR and a credit margin.

CRR expected value is the auction price of the CRR. For CRRs directly allocated to LSEs the CRR expected value is the market clearing price calculated by the CRR auction model. The inclusion of CRR expected value in the credit requirement is intended to cover the negative auction price of a CRR paid by the CAISO to the CRR holders. It also measures the excess credit a positively priced CRR may pose that can be used to offset credit requirements of other CRRs owned by the same holder.

The credit requirement of a CRR for a term of 1 year or shorter is defined as:

$$\textit{Credit Requirement} = -\textit{CRR Expected Value} + \textit{Credit Margin}$$

Due to the uncertainties of the market, the actual value of a CRR could be very volatile. A credit margin included in the credit requirement ensures sufficient credit coverage under the market uncertainty. The credit margin of a CRR is defined as the difference between the expected value and the fifth percentile value of the CRR.² That is:

$$\textit{Credit Margin} = \textit{CRR Expected Value} - \textit{5th Percentile CRR Value}$$

² See Appendix for detail discussion. Examples based on the 1st and 2.5th percentile values are also included in the Appendix.

5th Percentile CRR Value is determined according to the probability distribution of the value of the CRR. This value is selected so that the likelihood the credit requirement fails to fully cover a possible default of the CRR holder is less than or equal to five percent.

Then we have:

$$\text{Credit Requirement} = -5^{\text{th}} \text{Percentile CRR Value}$$

Other percentile values may also be considered. In the Appendix, the examples based on 1st, 2.5th, and 5th percentile values are presented.

4. Calculation of credit margins

For the first year of the CAISO MRTU, there is no historical LMP data available. The data from LMP study by the CAISO will be used to calculate the credit margins for all CRRs. In the future, actual historical LMP data will be used to update the credit margins.

In addition, the CRR data of other ISOs will be used as references for validating the calculated CRR credit margins.

IV. Long-Term CRR Credit Issues

There are several issues related to the credit requirements for holding Long-Term-CRR (LT-CRR, CRRs with terms longer than 1 year), including how the credit requirements are determined based on the 1-year CRR expected value and credit margin, how the credit requirements are adjusted over time, and lastly how much the additional credit requirements are for external LSEs.

1. Long-Term CRR credit requirement

The CAISO developed four options for consideration that could be used to determine credit requirement for holding LT-CRRs.

Option 1: $n * (-1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin})$

Option 2: $n * (-1 \text{ year CRR Expected Value}) + \sqrt{n} * (1 \text{ year Credit Margin})$

Option 3: $-1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin}$

Option 4: $n * (-1 \text{ year CRR Expected Value}) + 1 \text{ year Credit Margin}$

Option 1, among the four options, requires the largest credit deposit for holding the CRRs. It could discourage participation in CRR allocation and auction, which could eventually reduce the liquidity and effectiveness of the CRR market. On the other hand, Option 3 may not be able to adequately protect the CAISO and other CRR holders from default of certain holders. The CAISO therefore has a preference toward Option 2 and Option 4. The final decision will be made based on the feedbacks from the stakeholders.

In the Appendix numerical examples of all four options with three different percentile values are presented to help evaluate the impacts of each of the options.

2. Adjustment to LT-CRR credit requirements

The credit requirements for holding LT-CRRs will be adjusted not less than annually. The adjustment will account for the change of remaining terms of the LT-CRRs. The CRR credit margins and expected values will also be re-assessed based on the actual LMP data from the market operation of the past year.

Credit requirements will also be adjusted when the ownership of a CRR has changed through either secondary market trading or load migration. The new owner is subject to the CRR credit requirements in order to assume the ownership.

3. Additional credit requirement for Long-Term CRR held by external LSEs

External LSEs will be subject to the same credit requirements for holding LT-CRRs as other Market Participants. Additionally, external LSEs will be required to maintain one year of credit coverage for their Wheeling Access Charge (WAC) prepayment beyond the current period. Although the 1 year credit coverage for the WAC prepayment will increase the EAL, the external LSE will not need to post additional credit as long as their overall available credit position (Available Credit Limit less their EAL including WAC prepayment) remains positive.

V. Compliance Measures

For failure to meet credit requirements for holding CRRs, the following compliance measures are proposed:

- Terminate all CRR agreements with the default holder.

- Retain all payments due to the CRRs and resell seasonal CRRs for their remaining duration in subsequent monthly auctions.
- Retain all financial security.
- Exclude the holder from future CAISO CRR allocation and auctions processes.
- Prohibit the holder from acquiring CRRs in the secondary market and through any other means.

VI. Market Monitoring and Mitigation

The CAISO market rules prohibit Market Manipulation (37.7), including:

- Actions or transactions that are without legitimate business a purpose and that intended to or foreseeably could manipulate market prices, market conditions ...” (37.7.1.1)
- Collusion with another party for purposes of manipulating market prices, market conditions ...(37.7.4.2)

FERC’s own market rules also prohibit provision of false information to and ISO, and make it unlawful to:

- (1) use or employ of any device, scheme, or artifice to defraud,
- (2) make material false statement or omit material facts, or
- (3) engage in any act, practice or course of business that operate or would operate as a fraud or deceit upon any person.

The CAISO Department of Market Monitoring will monitor any unusual activities in the CRR allocation and auction processes. A variety of action might be taken to deter or monitor the type of conduct described above, including:

- Require disclosure of affiliations.
- Explicitly warn participants that the CAISO will monitor and refer such behavior to FERC.
- Refer to FERC.

Appendix: Methodologies and Examples

I. CRR Credit Margin and Credit Requirement

Assuming that credit requirement is assessed for the whole CRR portfolio of each holder (allowing credit offset), the credit requirement of a CRR for a term of 1 year or shorter is defined as:

$$\text{Credit Requirement} = -\text{CRR Expected Value} + \text{Credit Margin}$$

Credit margin of a CRR is defined as the difference between the expected value and the fifth percentile value of the CRR.³ That is:

$$\text{Credit Margin} = \text{CRR Expected Value} - 5\text{th Percentile CRR Value}$$

That is, $\text{Credit Requirement} = -5\text{th Percentile CRR Value}$

CRR Expected Value is the auction price of the CRR. For CRRs directly allocated to LSEs the *CRR Expected Value* is the market clearing price calculated by the CRR auction model. The inclusion of *CRR Expected Value* in the credit requirement is intended to cover the negative auction price of a CRR paid by the CAISO to the CRR holders. It also measures the excess credit a positively priced CRR may pose that can be used to offset credit requirements of other CRRs owned by the same holder.

5th Percentile CRR Value is determined according to the probability distribution of the value of the CRR. This value is selected so that the likelihood the credit requirement fails to fully cover a possible default of the CRR holder is less than or equal to five percent.

There are three kinds of probability distributions of CRR value with which the credit requirements are different. They are discussed below.

1. Credit requirement for CRR with high positive expected value

A CRR with high positive expected value almost certainly entitles the holder to a stream of revenues from the CAISO. In such case, the fifth percentile value on its probability distribution is greater or equal to zero. The likelihood for this CRR to have negative

³ A percentile is a value on a scale of one hundred that indicates the percent of a distribution that is equal to or below it. For example, the probability the variable's value is less than or equal to the 5th percentile value is 5 percent.

value, that is to require payments by the holder to the CAISO, is very small. The risk of default by the holder is therefore negligible. There is no need for the holder to post a credit requirement. Besides that, the CRR may possess excess credit that can be used to offset the credit requirements on other CRRs in the holder's portfolio.

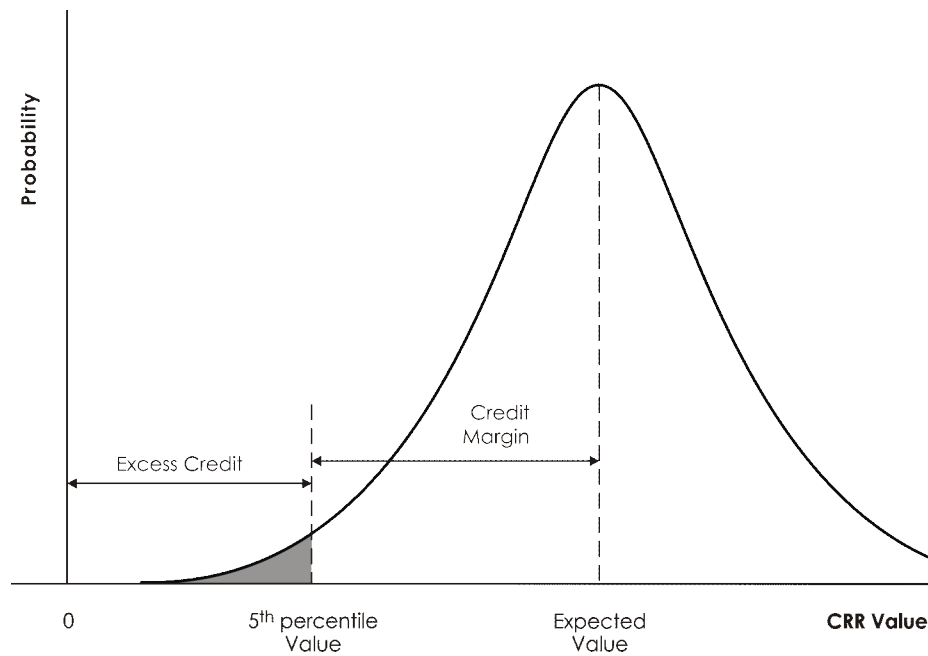


Figure 1. Distribution of CRR with High Positive Expected Value

2. Credit requirement for CRR with low positive expected value

A CRR with low positive expected value likely will result in a positive revenue stream for the holder. It is, however, also possible for the CRR to result in a payment obligation for the CRR holder because the probability distribution of CRR payments stretches to the negative side, as shown in Figure 2. For such CRRs, a credit requirement is needed to cover the possible loss if the holder were unable or unwilling to make the required payments to the CAISO, although the likelihood of payments by the holder to the CAISO is less than 50-50.

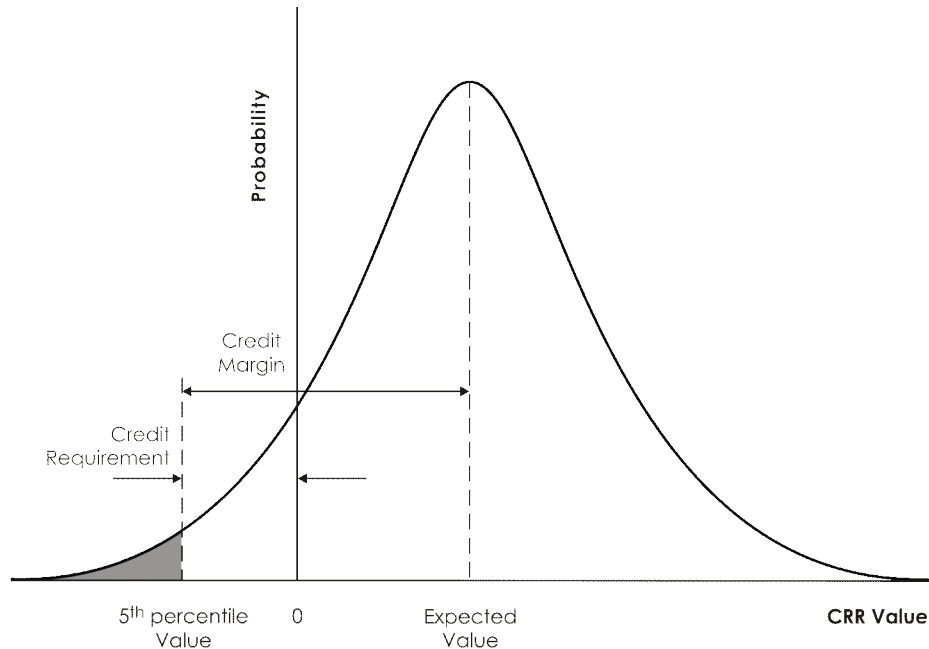


Figure 2. Distribution of CRR with Low Positive Expected Value

3. Credit requirement for CRR with negative expected value

A CRR with negative expected value is a liability. The holder is paid to hold the CRR. The holder, on the other hand, is expected to make payments to the CAISO. It is still possible that the CRR will generate positive cash flow for the holder, but it is much less likely compared to the probability of making payments to the CAISO. While the holder is willing to hold the CRR because the holder believes that the expected value of the required payments is less than the payment for holding the CRR, these expectations may be incorrect. It is precisely because the payments may turn out to be much higher that LSEs may wish to buy positively priced CRRs to hedge their congestion costs and that the CAISO needs to require credit coverage of holders of negatively priced CRRs. In such case the loss caused by default by the holder may be more significant than in the other two cases. To properly limit the financial risk, a greater credit requirement is needed for this type of CRR.

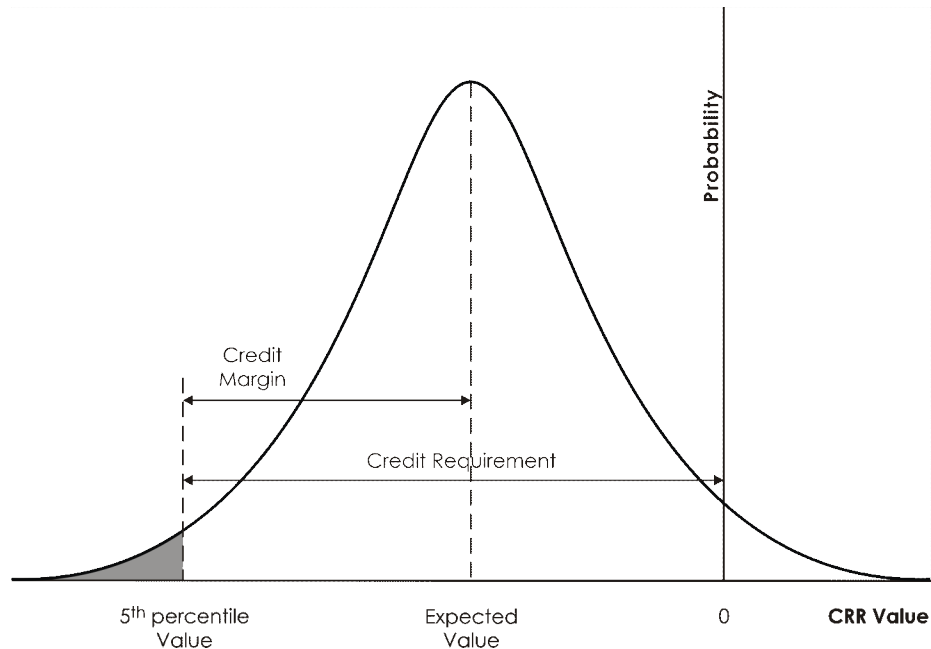


Figure 3. Distribution of CRR with Negative Expected Value

II. Long-Term CRR Credit Requirement

Long-Term CRR (LT-CRR) credit requirement is determined based on the credit requirement for CRR of a single term (1 year or shorter).

The CAISO has developed four options for calculating the LT-CRR credit requirement. With the assumption that credit requirement is set for the whole CRR portfolio of each holder (allowing credit offset), the options are:

Option 1: $n * (-1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin})$

Option 2: $n * (-1 \text{ year CRR Expected Value}) + \sqrt{n} * (1 \text{ year Credit Margin})$

Option 3: $-1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin}$

Option 4: $n * (-1 \text{ year CRR Expected Value}) + 1 \text{ year Credit Margin}$

Of the four, Option 1 is the most conservative and Option 3 is the least conservative.

III. Examples of CRR Credit Requirement

4 CRR examples are listed in Table 1. The expected value and percentile values in Statistics section have been derived based on the CAISO LMP study data. Then credit margins and credit requirements are calculated based on the definitions discussed in this appendix.

Table 1. Credit Margin and Credit Requirement for a 1-Year CRR
 (\$/MW-Year)

CRR	A	B	C	D	Portfolio
Statistics					
Expected Value	-6,807	-13,556	21,298	316	
1 Percentile	-8,281	-19,786	19,919	-290	
2.5 Percentile	-7,723	-16,385	20,050	-63	
5 Percentile	-7,235	-15,162	20,076	296	
Credit Margin					
1 Percentile	1,473	6,230	1,379	606	
2.5 Percentile	916	2,829	1,248	379	
5 Percentile	428	1,605	1,222	20	
Credit Requirement					
1 Percentile	8,281	19,786	-19,919	290	8,438
2.5 Percentile	7,723	16,385	-20,050	63	4,121
5 Percentile	7,235	15,162	-20,076	-296	2,025

Here are the step-by-step calculations of credit margin and credit requirement of CRR A at 5th percentile values.

$$\begin{aligned}
 \text{Credit Margin} &= \text{CRR Expected Value} - \text{5th Percentile CRR Value} \\
 &= -6807 - (-7235) \\
 &= 428
 \end{aligned}$$

$$\begin{aligned}
 \text{Credit Requirement} &= -\text{5th Percentile Value} \\
 &= 7235
 \end{aligned}$$

And for CRR C at 2.5th percentile value:

$$\begin{aligned}
 \text{Credit Margin} &= 21298 - 20050 \\
 &= 1248
 \end{aligned}$$

$$\text{Credit Requirement} = -20050$$

The credit requirement for the portfolio is the sum of credit requirements of all CRRs in the portfolio or zero, whichever is larger. That is:

$$\text{Portfolio Credit Requirement} = \max(0, \sum CRR_i \text{ Credit Requirement})$$

The credit requirements for a 10-year CRR calculated with all four options for LT-CRR credit requirement are presented in Table. 2.

Table 2. Credit Requirement for a 10-Year CRR
(\$/MW)

CRR	A	B	C	D	Portfolio
Statistics					
1-Year Expected Value	-6,807	-13,556	21,298	316	1,251
Option 1: $n * (-1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin})$					
1 Percentile	82,809	197,861	-199,194	2,901	84,377
2.5 Percentile	77,231	163,854	-200,501	626	41,209
5 Percentile	72,347	151,619	-200,761	-2,957	20,249
Option 2: $n * (-1 \text{ year CRR Expected Value}) + \sqrt{n} * (1 \text{ year Credit Margin})$					
1 Percentile	72,734	155,264	-208,624	-1,243	18,131
2.5 Percentile	70,970	144,510	-209,037	-1,963	4,480
5 Percentile	69,421	140,641	-209,119	-3,096	0
Option 3: $-1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin}$					
1 Percentile	8,281	19,786	-19,919	290	8,438
2.5 Percentile	7,723	16,385	-20,050	63	4,121
5 Percentile	7,235	15,162	-20,076	-296	2,025
Option 4: $n * (-1 \text{ year CRR Expected Value}) + 1 \text{ year Credit Margin}$					
1 Percentile	69,548	141,794	-211,605	-2,554	0
2.5 Percentile	68,990	138,393	-211,736	-2,781	0
5 Percentile	68,497	137,170	-211,762	-3,140	0

Option 1 is simply the ten times of the credit requirement for the 1-year CRR, and Option 3 is exactly the same as the 1-year CRR credit requirement.

The credit requirements for CRR A at 5th percentile value are calculated as the following:

Option 2:

$$\begin{aligned} \text{Credit Requirement} &= n * (-1 \text{ year CRR Expected Value}) + \sqrt{n} * (1 \text{ year Credit Margin}) \\ &= 10 * (-6807) + \sqrt{10} * 427 \\ &= 68070 + 1351 \\ &= 69421 \end{aligned}$$

Option 4:

$$\begin{aligned} \text{Credit Requirement} &= 10 * -(-6807) + 427 \\ &= 68070 + 427 \\ &= 68497 \end{aligned}$$

IV. CRR Credit Requirement without Credit Offset

This section discusses the methodologies to determine CRR credit margin and credit requirements based on the assumption that no credit offset within a CRR portfolio is allowed. This is an option to be considered to address the situation of a CRR portfolio having positive and negative CRRs with differing terms. The expiration of positive CRRs could result in an increase in the credit requirement for a CRR holder that it may be unable to meet.

Credit Margin:

$$\text{Credit Margin} = \text{CRR Expected Value} - 5\text{th Percentile CRR Value}$$

Credit Requirement:

$$\text{Credit Requirement} = \max(0, -\text{CRR Expected Value} + \text{Credit Margin})$$

That is: $\text{Credit Requirement} = \max(0, -5\text{th Percentile CRR Value})$

LT-CRR Credit Requirement

Option 1: $n * \max(0, -1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin})$

Option 2: $n * \max(0, -1 \text{ year CRR Expected Value}) + \sqrt{n} * (1 \text{ year Credit Margin})$

Option 3: $\max(0, -1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin})$

Option 4: $n * \max(0, -1 \text{ year CRR Expected Value}) + 1 \text{ year Credit Margin}$

**Table 3. Credit Margin and Credit Requirement for a 1-Year CRR
(\$/MW-Year)**

CRR	A	B	C	D	Portfolio
Statistics					
Expected Value	-6,807	-13,556	21,298	316	
1 Percentile	-8,281	-19,786	19,919	-290	
2.5 Percentile	-7,723	-16,385	20,050	-63	
5 Percentile	-7,235	-15,162	20,076	296	
Credit Margin					
1 Percentile	1,473	6,230	1,379	606	
2.5 Percentile	916	2,829	1,248	379	
5 Percentile	427	1,605	1,222	20	
Credit Requirement					
1 Percentile	8,281	19,786	0	290	28,357
2.5 Percentile	7,723	16,385	0	63	24,171
5 Percentile	7,235	15,162	0	0	22,397

The credit requirement for the portfolio is the sum of credit requirements of all CRRs.

That is:

$$\text{Portfolio Credit Requirement} = \sum \text{CRR}_i \text{ Credit Requirement}$$

Compared to Table 1, there is no negative credit requirement in Table 3. The credit requirement for the CRR portfolio is therefore higher than that when credit offset is allowed within a CRR portfolio.

Table 4. Credit Requirement for a 10-Year CRR
(\$/MW)

CRR	A	B	C	D	Portfolio
Statistics					
1-Year Expected Value	-6,807	-13,556	21,298	316	3,251
Option 1: $n * \max(0, -1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin})$					
1 Percentile	82,809	197,861	0	2,901	283,571
2.5 Percentile	77,231	163,854	0	626	241,710
5 Percentile	72,347	151,619	0	0	223,966
Option 2: $n * \max(0, -1 \text{ year CRR Expected Value}) + \sqrt{n} * (1 \text{ year Credit Margin})$					
1 Percentile	72,734	155,264	4,361	1,917	234,276
2.5 Percentile	70,970	144,510	3,948	1,197	220,625
5 Percentile	69,421	140,641	3,866	64	213,992
Option 3: $\max(0, -1 \text{ year CRR Expected Value} + 1 \text{ year Credit Margin})$					
1 Percentile	8,281	19,786	0	290	28,357
2.5 Percentile	7,723	16,385	0	63	24,171
5 Percentile	7,235	15,162	0	0	22,397
Option 4: $n * \max(0, -1 \text{ year CRR Expected Value}) + 1 \text{ year Credit Margin}$					
1 Percentile	69,548	141,794	1,379	606	213,327
2.5 Percentile	68,990	138,393	1,248	379	209,010
5 Percentile	68,497	137,170	1,222	20	206,909

As can be seen from Table 4, Option 2 and Option 4 overstate the credit requirements for CRRs with high positive expected values (CRR 3). In such cases, these two options are more conservative. They are less conservative compared to Option 1 for CRRs with negative expected values.