



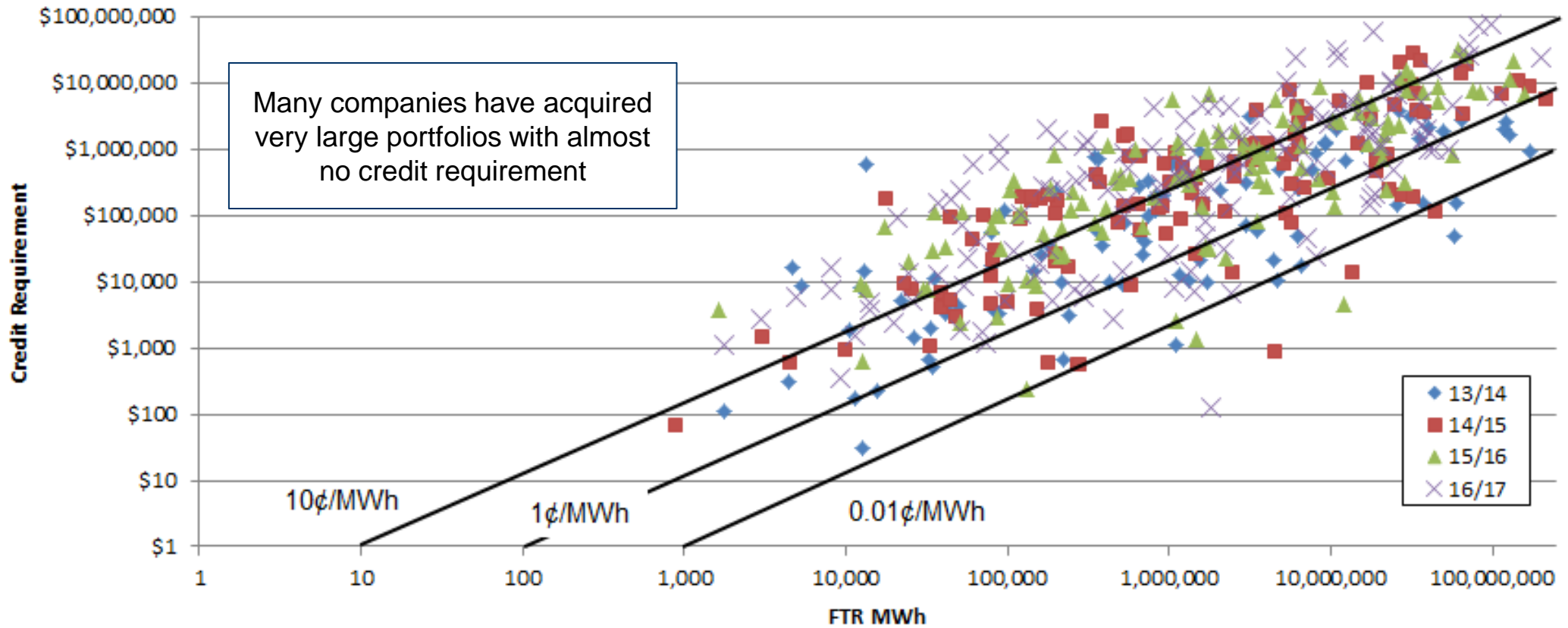
FTR Credit Enhancements

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Credit Subcommittee
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- Areas of Discussion
 - FTR positions, sometimes very large, with little or no credit requirement
 - FTR credit uncertainty and auction clearing disruption associated with the Undiversified Adder
- Proposed Solutions
 - Implement a per-MWh minimum credit requirement
 - Possible monthly deductible to the Undiversified Adder

Large Portfolios with Little or No Credit Requirement

Total FTR MWh versus Credit Requirement by Planning Period Annual Buy Obligations Only



- The Undiversified Adder is an important tool in protecting members from extreme counter-flow tail risk
- However, Undiversified collateral calls create credit uncertainty and create a risk of delay in market clearing
 - 56 Undiversified collateral calls were made from June 2016 through March 2018

- The underlying FTR credit requirement calculation starts with a monthly credit requirement calculated for each FTR
 - Monthly price minus discounted monthly historical for each FTR
 - Historical value is the weighted average of the path congestion value for that month over the past three years on a monthly basis, with a 10% adjustment factor
 - Includes any applicable PROMOD-calculated reduction in congestion value of low frequency-high impact transmission system upgrades
 - Separate historic values used for on-peak, off-peak and 24-hour FTRs
- Within each month, individual FTR credit requirements are added to form a single credit requirement for that month
 - For cleared FTRs only, negative individual FTR credit requirements net against positive requirements within the same month.
- Total requirement is the sum of all positive monthly subtotals

- Undiversified Adder
 - Targets counterflow tail risk
 - Calculated separately for every month on a portfolio basis
 - Not calculated for individual FTRs
 - Added to underlying credit requirement for each month
 - Based solely on portfolio net cleared price
 - Cannot be applied until market is in process of clearing
 - Net negative cleared portfolio-month price causes adder to be applied
 - Adder is 3 times the value of the net negative FTR auction-based price

- Within each month, underlying and undiversified adder are summed to monthly subtotal
- ARR credits in the account are subtracted from credit requirements each month
- The total credit requirement for an account is the sum of all positive monthly subtotals



Current FTR Credit Requirement Calculation Example

Period	Class Type	Trade Type	Cleared MW	Path Price	Path Adjusted Historical Value	Credit Requirement
JUN	24H	Buy	1	\$100	\$250	-\$150
JUN	24H	Buy	1	-\$150	-\$100	-\$50
			Underlying Monthly Requirement:			-\$200
			Undiversified Adder			\$150
			Net Monthly Credit Requirement			-\$50

Since the monthly subtotal is negative it would not be counted in the total net credit requirement (only positive months are summed)

Analysis

- Evaluated proposed enhancements using four years of historical data
 - Planning years 13/14, 14/15, 15/16, 16/17
- Performed stress test against defaults in 07/08
- Narrowed solutions to seven options in three groups

	Group 1	Group 2	Group 3
Monthly Undiversified Deductible	None	\$100,000	\$6M
Per MWh Minimum	5¢, 10¢, 15¢	5¢, 10¢, 15¢	Tiered*
Historical Adjustments	Status quo (10%)	Status quo (10%)	25% counterflow 10% prevailing flow

*Tiered incremental minimum: <100K MWh:25¢; 100K-1MM MWh:10¢; 1MM-10MM MWh: 5¢; >10MM MWh:1¢

- Applied on a monthly basis
- Cap would be applicable only to the per MWh minimum, not the underlying requirement *
- Example:

Underlying Credit Requirement	Per MWh Minimum	Final Credit Requirement Without Cap	Final Credit Requirement With Cap
\$45MM	\$55MM	\$55MM	\$50MM
\$60MM	\$55MM	\$60MM	\$60MM

* Cap implementation details to be determined since cap is a total portfolio concept, but minimum is monthly

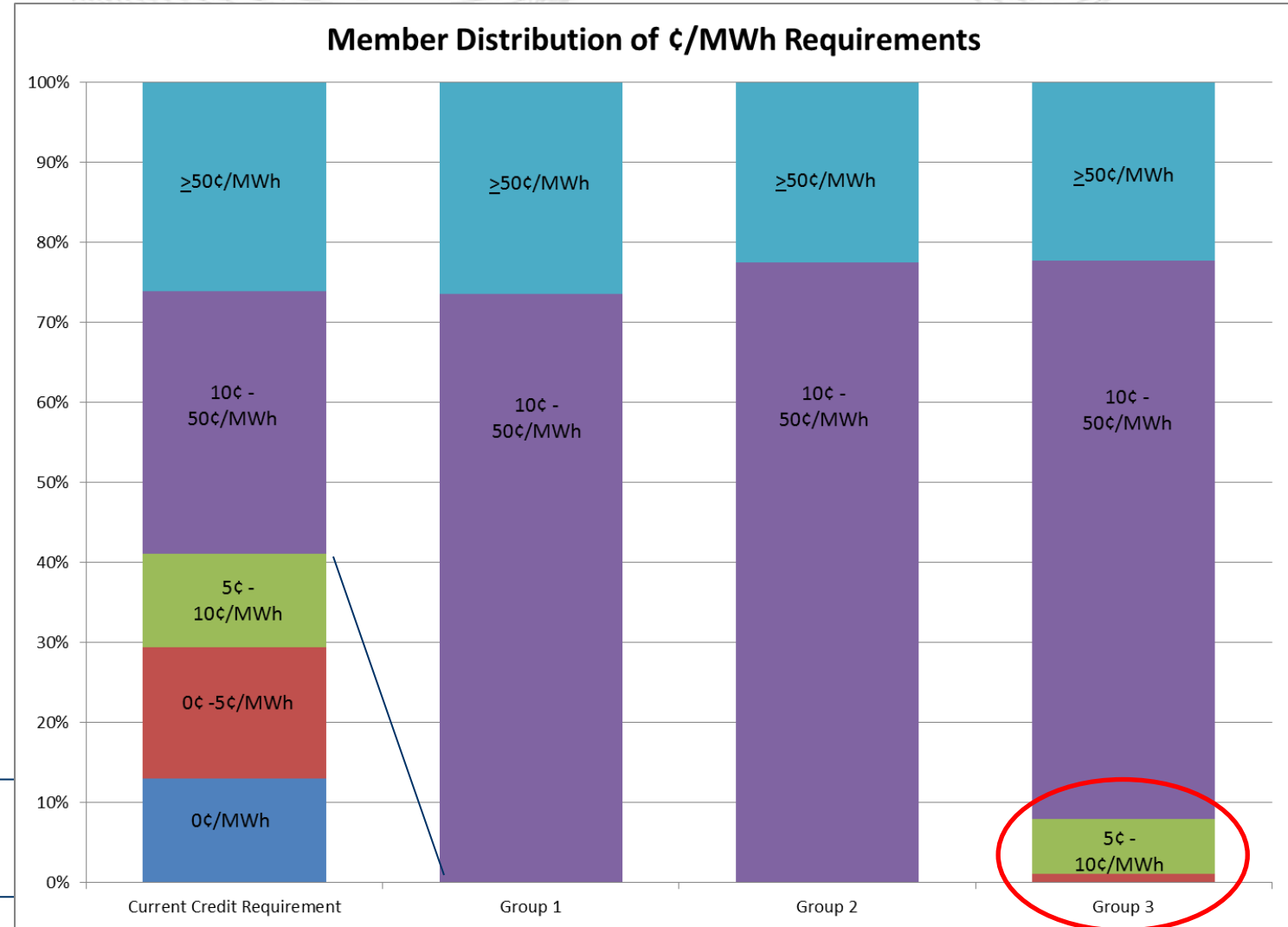
- \$56 Million total FTR default in 2007-2008
 - \$52M from one company
 - \$4.2M from three additional companies
- Current credit policy with Undiversified Adder would have covered all but \$800,000 of the total \$56M default
- An Undiversified deductible would not have impacted coverage of the one large defaulting member, but would have impacted coverage of the others
 - \$1.4M loss with \$100K deductible
 - \$2.1M loss with \$200K deductible
- 10¢/MWh minimum would have covered less than 10% of the default
 - Still short \$6 million even at \$1.00/MWh
- A per-MWh minimum can help in other ways, but is not a substitute for the Undiversified adder

- 56 Undiversified collateral calls were made from June 2016 through March 2018
 - 38 (two-thirds) were for less than \$100,000
 - 8 more were under \$200,000
 - Most of the calls over \$100,000 were in monthly auctions involving multiple months, and might have been avoided with a monthly deductible of \$100,000
 - A deductible large than \$100,000/month would have had little additional impact on collateral calls

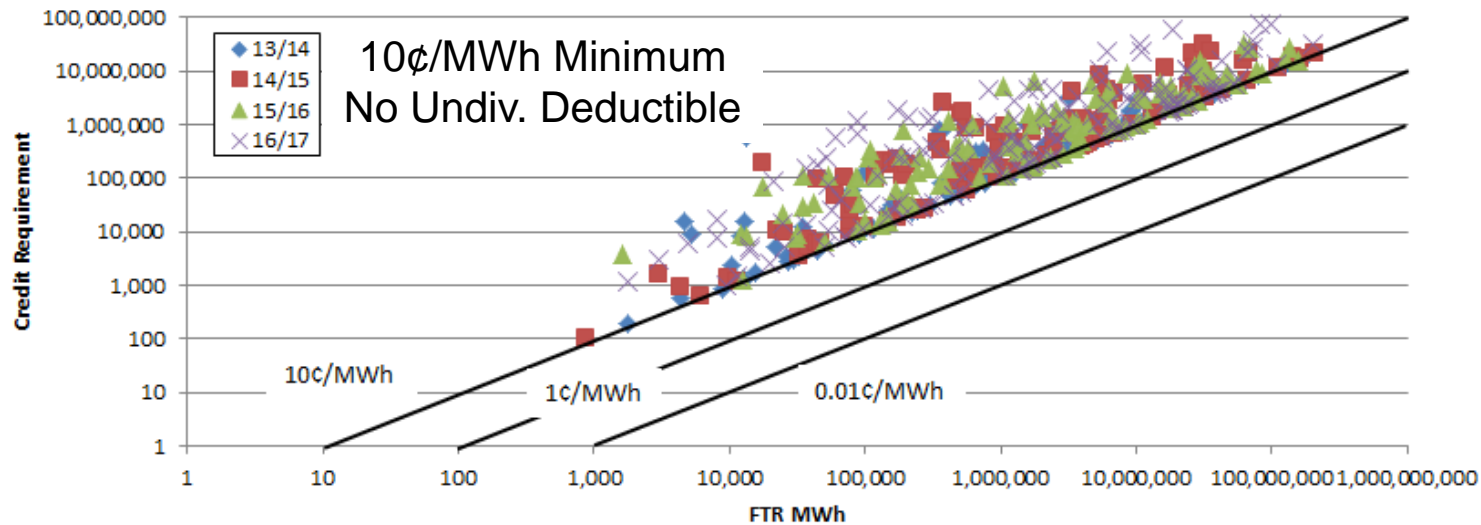
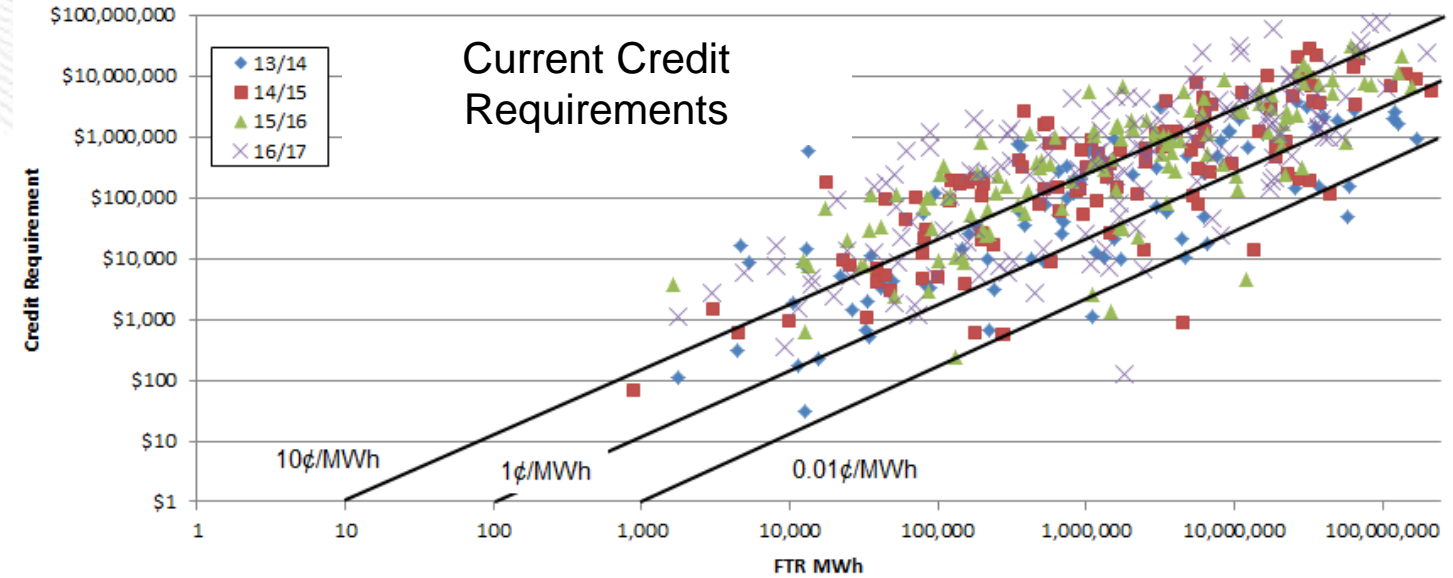
- **Deductible Tradeoff: Coverage vs. administration/uncertainty**
 - A \$100,000/month deductible would have increased exposure in the 2007/2008 stress test by \$600,000 (total \$1.4MM)
 - A \$100,000/month deductible would have eliminated the large majority of Undiversified collateral calls
- **PJM recommends no undiversified deductible**
 - But would not oppose a \$100,000 undiversified deductible if Members endorse that option, recognizing the tradeoff

- A tiered minimum can leave a large portfolio with a small per-MWh requirement
 - Not possible with a flat minimum
- Under the flat per-MWh minimum options, all members have a credit requirement of at least the minimum.
- ARR provides an additional credit offset

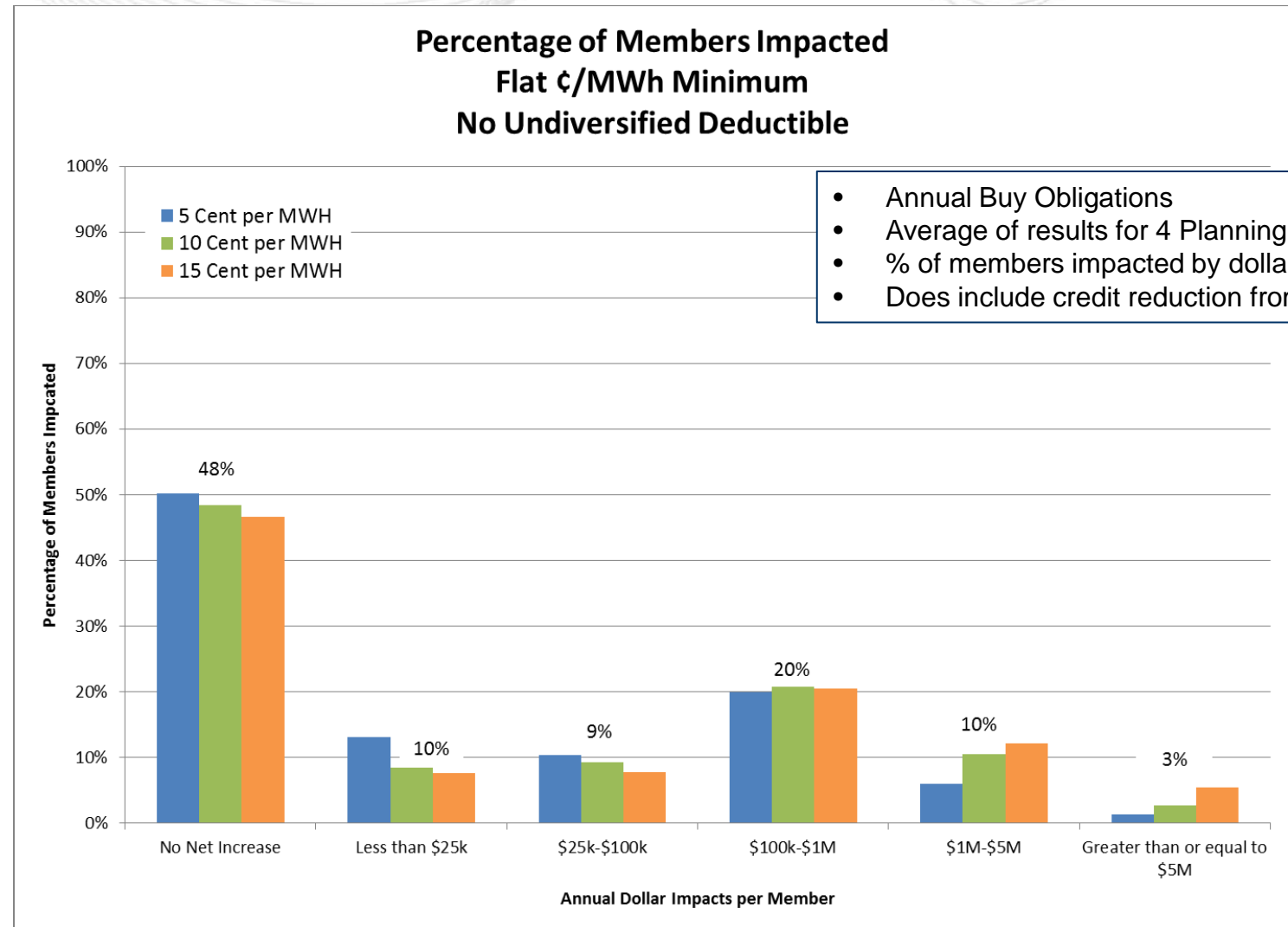
- Annual Buy Obligations
- Average of Results for 4 Planning Years
- Does not include credit reduction from ARRs



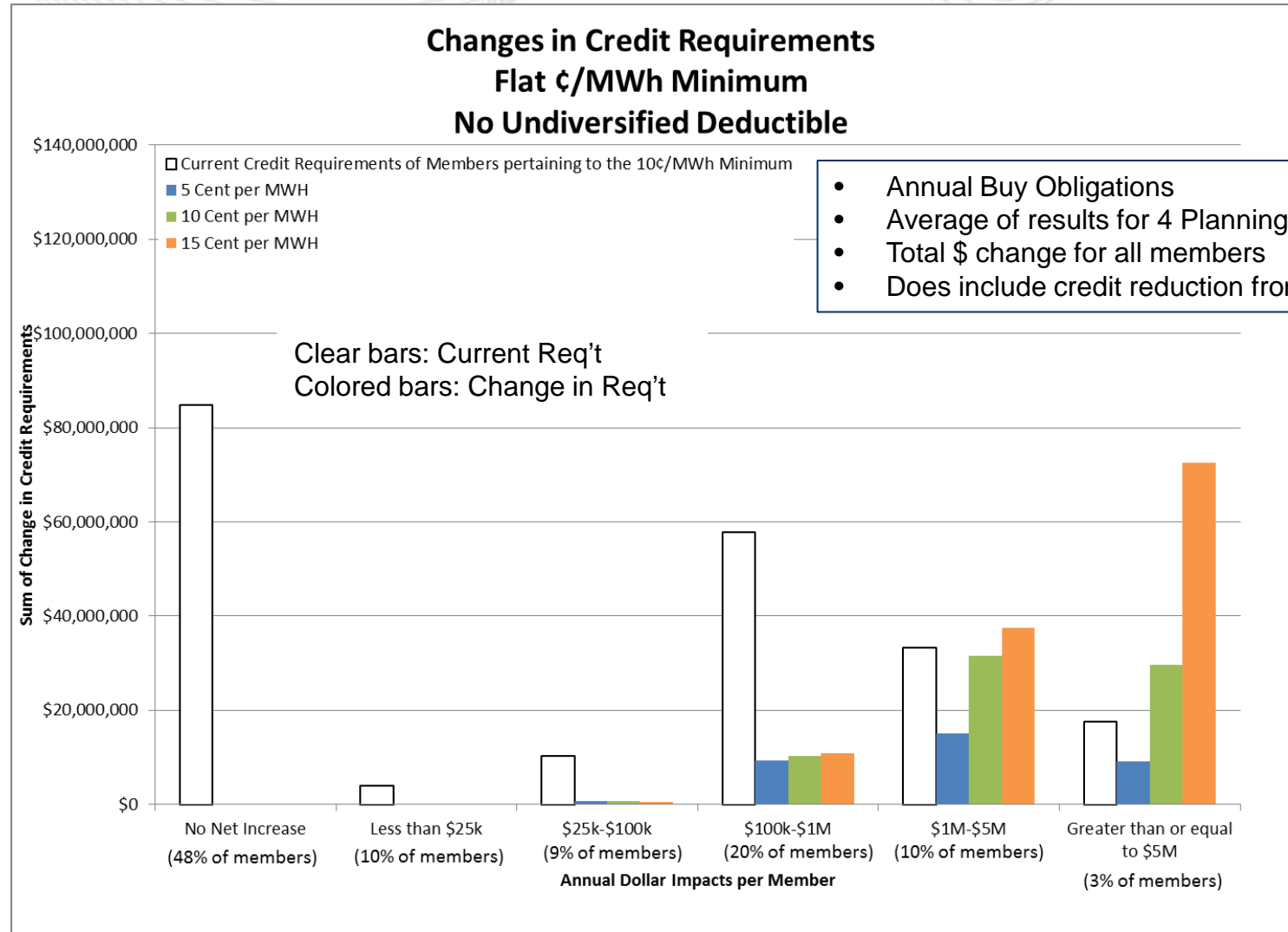
- Each dot represents one portfolio's FTR Annual Auction position for Buy Obligations Only.
- Current requirements allow portfolios (even large ones) to have effectively no credit requirement (less than \$.0001/MWh in this historical analysis)
- A 10¢/MWh monthly minimum assures that all portfolios have at least a modest credit requirement.



- Impact on most members is very small
- 58% would have no increase or less than \$25,000 for the whole planning year
- 67% would have a total increase under \$100,000



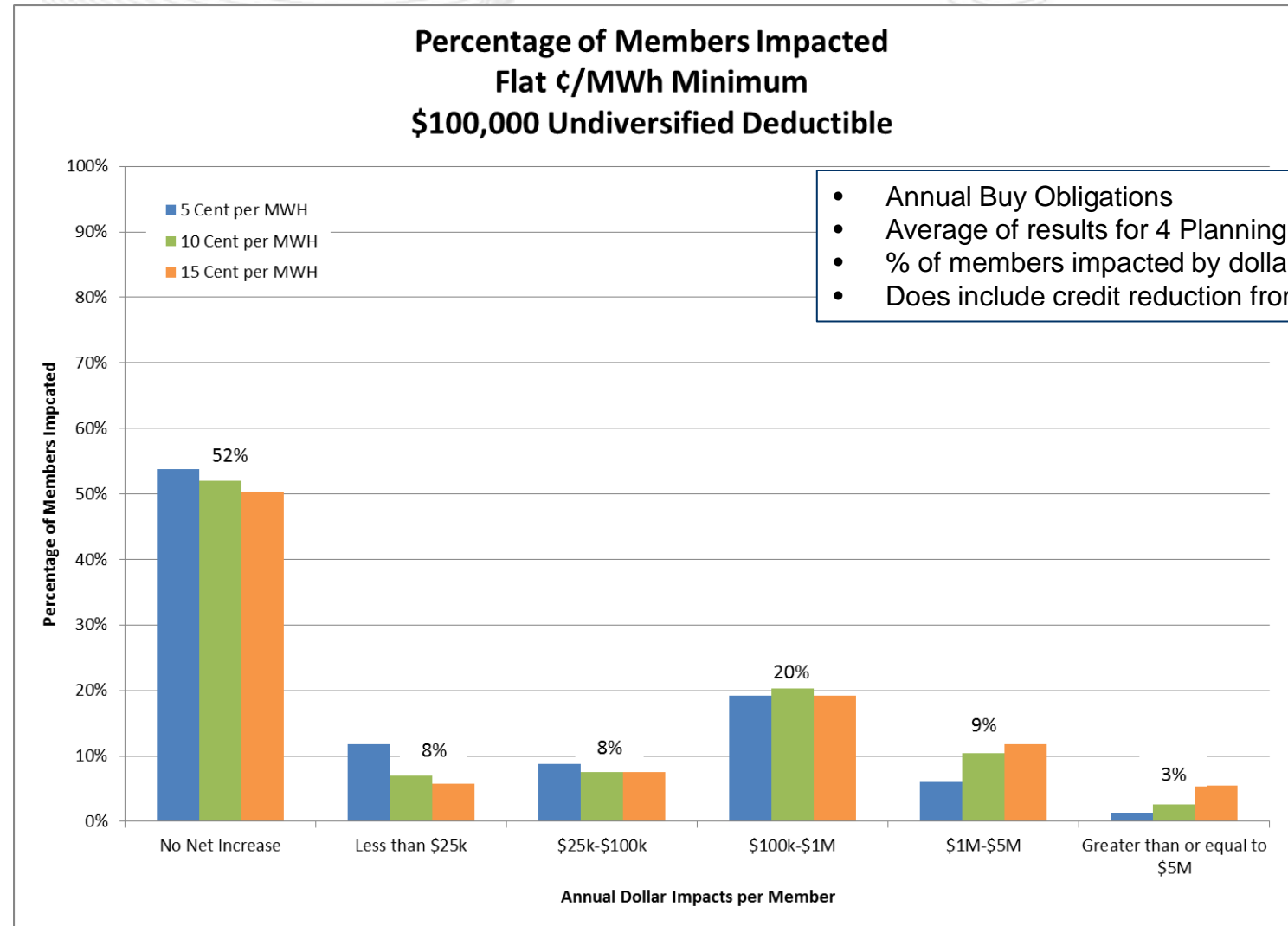
- As expected, dollar impact is concentrated in very few members



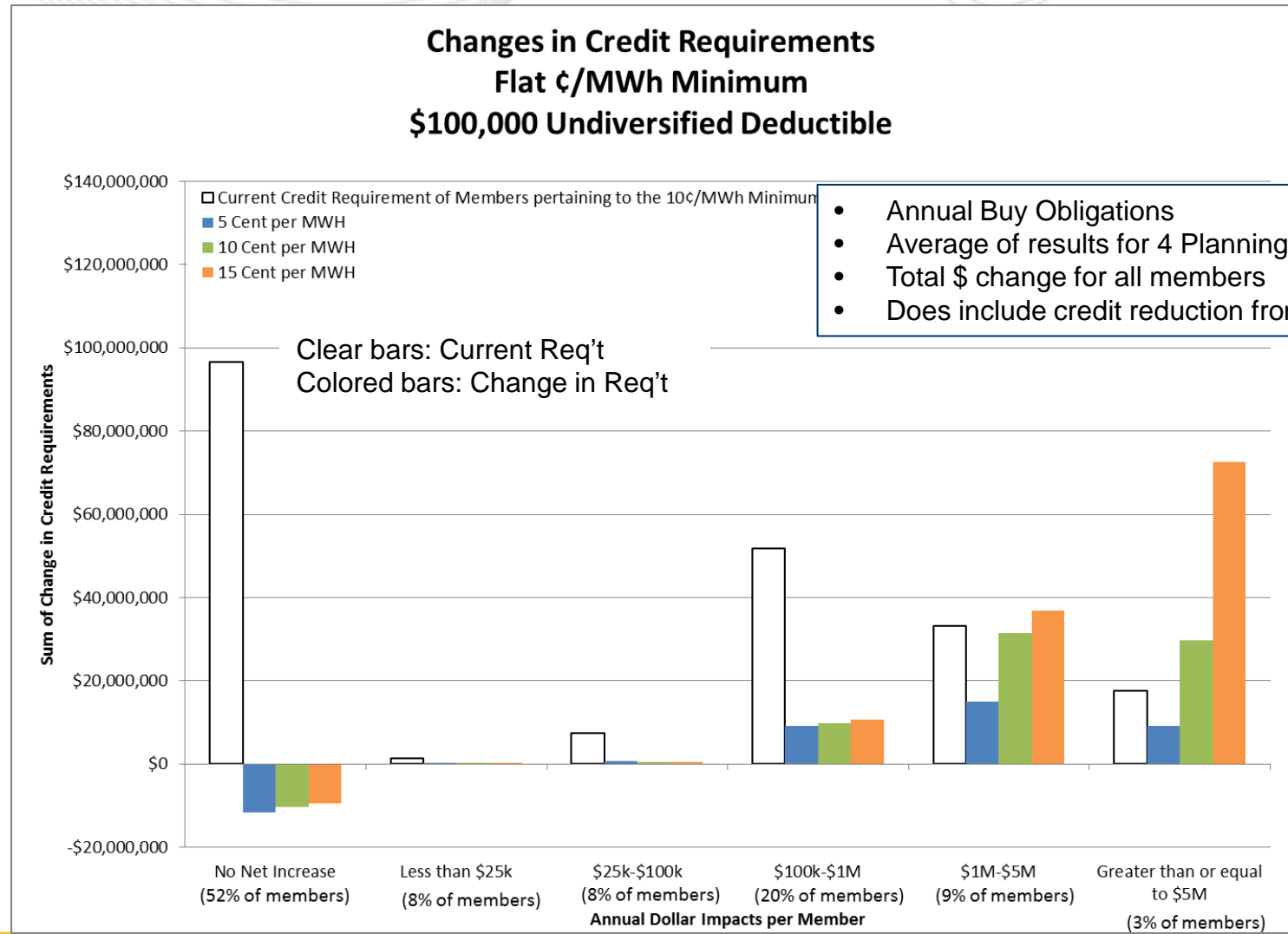
- Annual Buy Obligations
- Average of results for 4 Planning Years
- Total \$ change for all members
- Does include credit reduction from ARRs

\$100k/Month Undiversified Deductible Member Impact - %

- The \$100K/month Undiversified deductible increased the number of members experiencing no increase

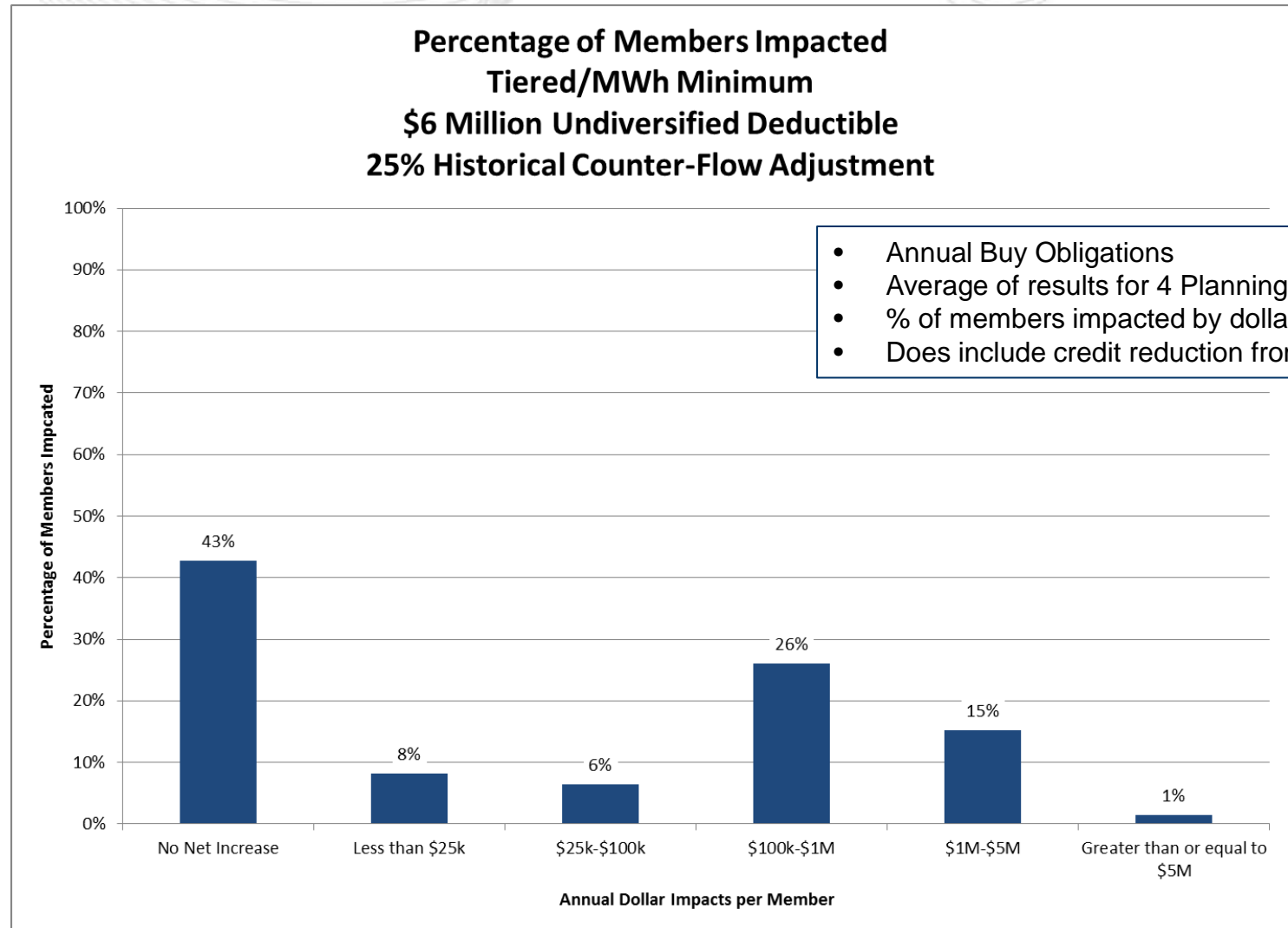


- The Undiversified deductible also significantly decreased credit requirements for some members
- Reductions in total requirements show that a per-MWh minimum is not a substitute for the Undiversified Adder

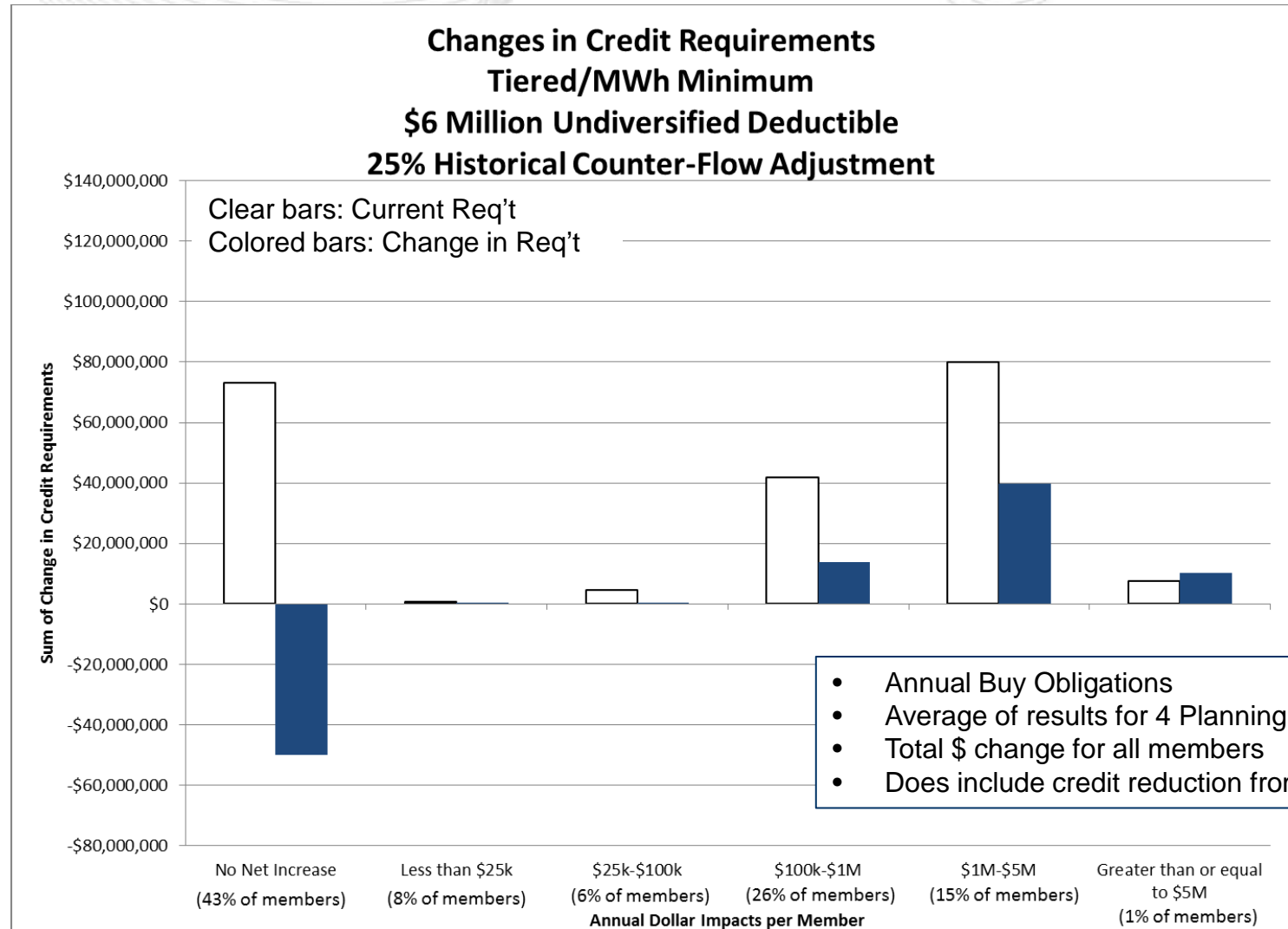


\$6M/Month Undiversified Deductible Member Impact - %

- Distribution of impacts (by dollar impact groups) seems similar to the options with a flat per-MWh minimum
- 51% would have no increase or less than \$25,000 for the whole planning year
- 57% would have a total increase under \$100,000



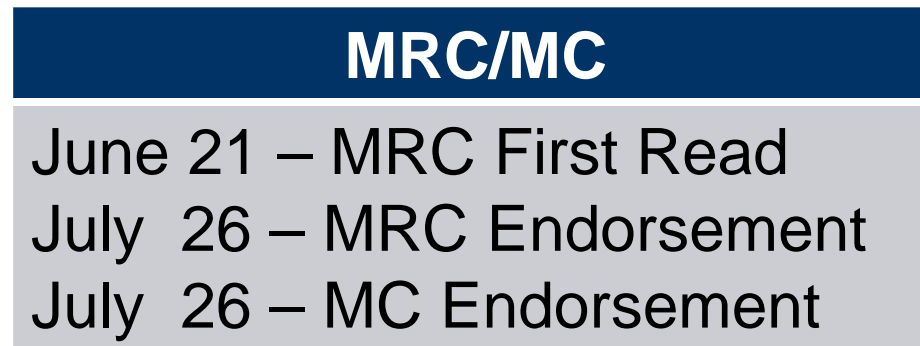
- But the actual dollar amounts are significantly different
- Many members lose most of their credit requirement
- Larger portfolios do not see the same increase as with a flat minimum
- A per-MWh minimum is not a substitute for the Undiversified Adder



Recommendation and Endorsement Plan

- 10¢/MWh minimum requirement
- No undiversified deductible
 - But PJM would not oppose a \$100,000 undiversified deductible if Members, recognizing the tradeoff, endorse that option
- No change to the 10% Historical Adjustment Factor
- Implement in Fall 2018
- Transition plan: freeze all credit-screened activities for FTR Participants with insufficient credit (FTR, RPM, exports and virtual transactions), except for sales of existing FTR positions if such sales would reduce the credit requirement

- Two main endorsement items
 - Per-MWh minimum requirement
 - 10¢ flat minimum
 - 10¢ flat minimum with \$50MM cap
 - Tiered minimum (with \$6MM undiversified monthly deductible and change to counterflow historical value adjustment factor)
 - Undiversified deductible
 - \$100,000/month (applicable to 10¢ flat minimum options)
- Subcommittee endorsement is requested via a Survey Monkey poll that will be open this week



- Continued analysis and discussion of additional options
 - Eliminate credit netting for counter-flow FTRs
 - Undiversified adder
 - Volatility
 - Path correlations
 - Path-specific counterflow adders
 - Mark to Market
 - FTR minimum capitalization requirements