



FTR Credit Enhancements

Credit Subcommittee
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May 18, 2018

- In accordance with the Issue Charge endorsed February 12, 2018:
 - PJM has been analyzing possible FTR credit enhancements related to the calculation of direct FTR credit requirements, specifically, minimum requirements (a), and undiversified adder (c)
 - Minimum capitalization (b) and mark-to-market requirements [d] have not been part of the immediate analysis but will be considered separately

- Establish credit requirements for those members who have FTR positions, sometimes very large, but who have little or no existing credit requirement
- Reduce uncertainty during auctions by decreasing in-auction collateral calls associated with the Undiversified Adder

- Looked at changes to the historical adjustment, undiversified deductible, and per-MWh minimum
- Evaluated many combinations of changes using four years of historical data
 - Planning years 13/14, 14/15, 15/16, 16/17
- Considered robustness
- Looked at credit shortfalls and excesses
- Performed stress test against defaults in 07/08

- Many combinations improved credit efficiency (shortfalls vs. excesses) in some years but performed poorly in others
 - No combination of changes consistently stood out from the pack
- Refocused solely on minimum requirements and Undiversified deductible
- Looked ultimately at 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¢

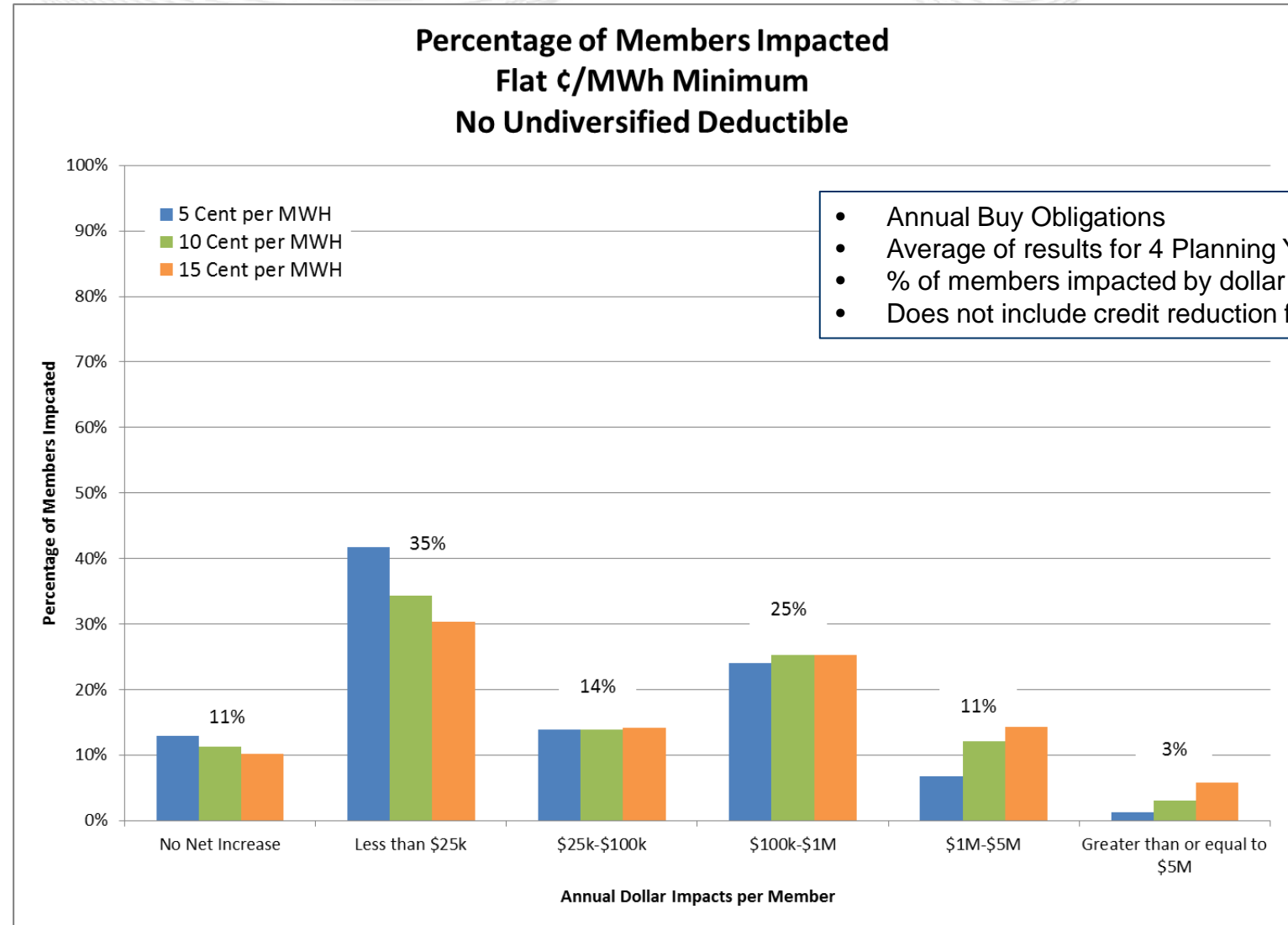
- \$56 Million total FTR default in 2007-2008
 - \$52M from one company
 - \$4.2M from three additional companies
- Current credit policy with Undiversified Adder would have covered all but \$800,000 of the total \$56M default
- An Undiversified deductible would not impact coverage of the one large company but would impact coverage of the others
 - \$1.4M loss with \$100K deductible
 - \$2.1M loss with \$200K deductible
 - \$3.8M loss with \$300K 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 \$200k/month deductible would have had little additional impact on collateral calls
- Undiversified collateral calls create credit uncertainty and can cause delays in market clearing

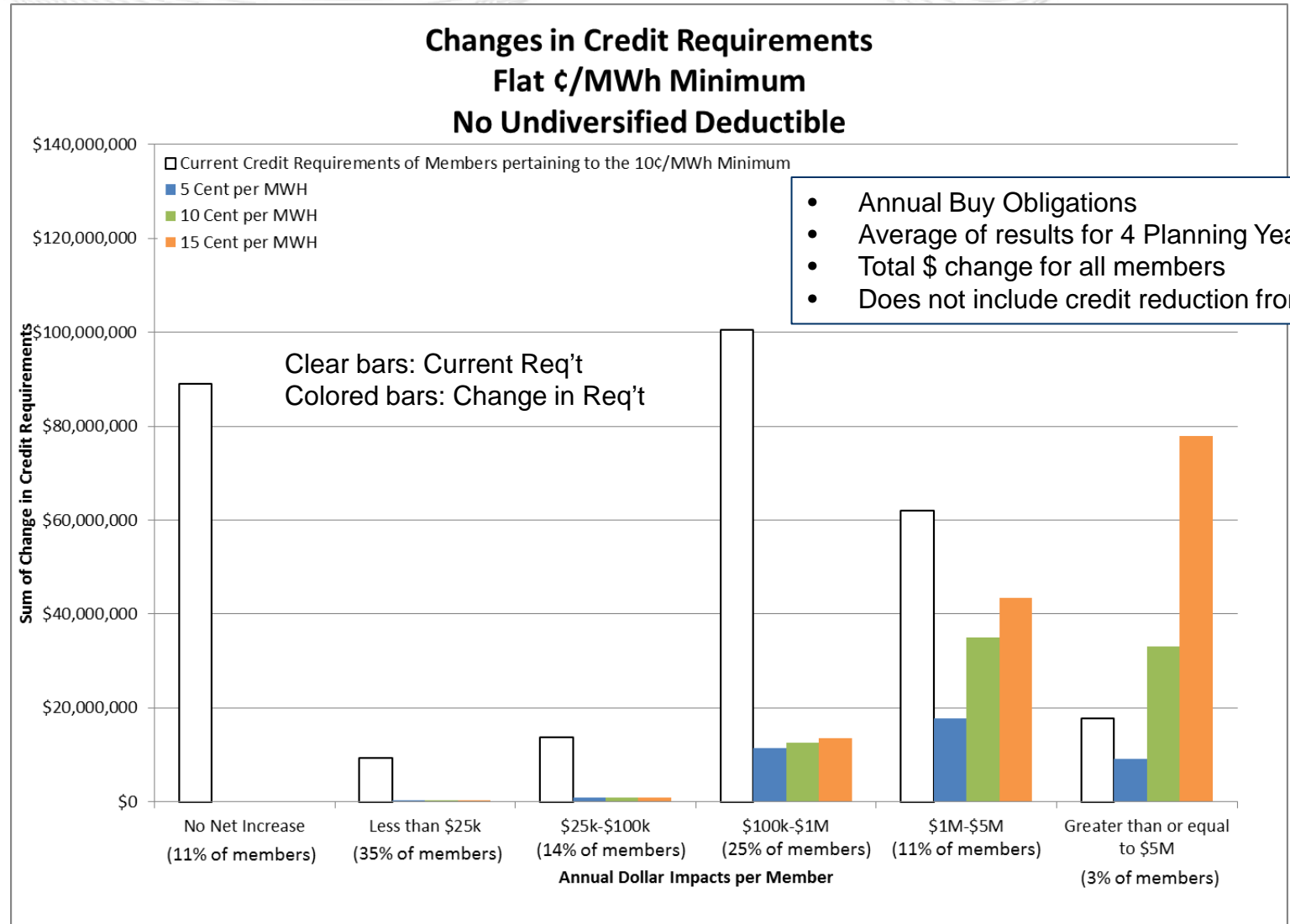
- PJM can support both a zero Undiversified deductible and a \$100k/month Undiversified deductible
 - A \$100k/month deductible would have increased exposure in the 2007/2008 stress test by \$600,000
 - A \$100k/month deductible would have eliminated the large majority of Undiversified collateral calls
- PJM will look to the members to evaluate the tradeoff between coverage reduction and collateral call reduction created by a \$100k/month Undiversified deductible

- The following graphs were developed to demonstrate the impacts on credit requirements from the analyzed options, as well as each option's ability to meet the objective of the Issue Charge
- Credit requirements and associated changes shown are an average over the four years analyzed (13/14, 14/15, 15/16, and 16/17) and are representative of Annual Buy Obligations only
 - Reductions from ARR credits are not included in these slides

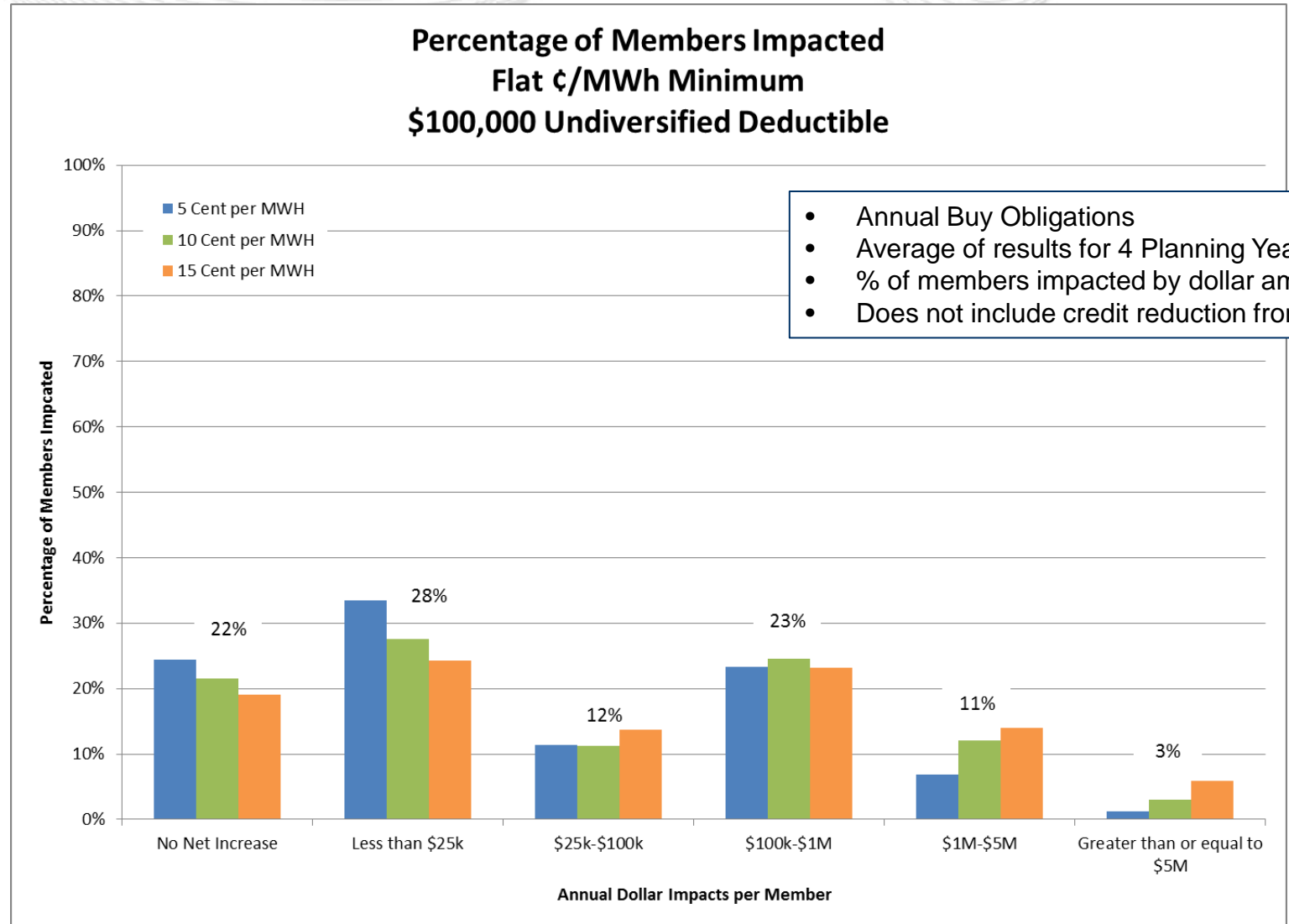
- Impact on most members is very small
- 46% would have no increase or less than \$25,000 for the whole planning year
- 60% would have a total increase under \$100,000



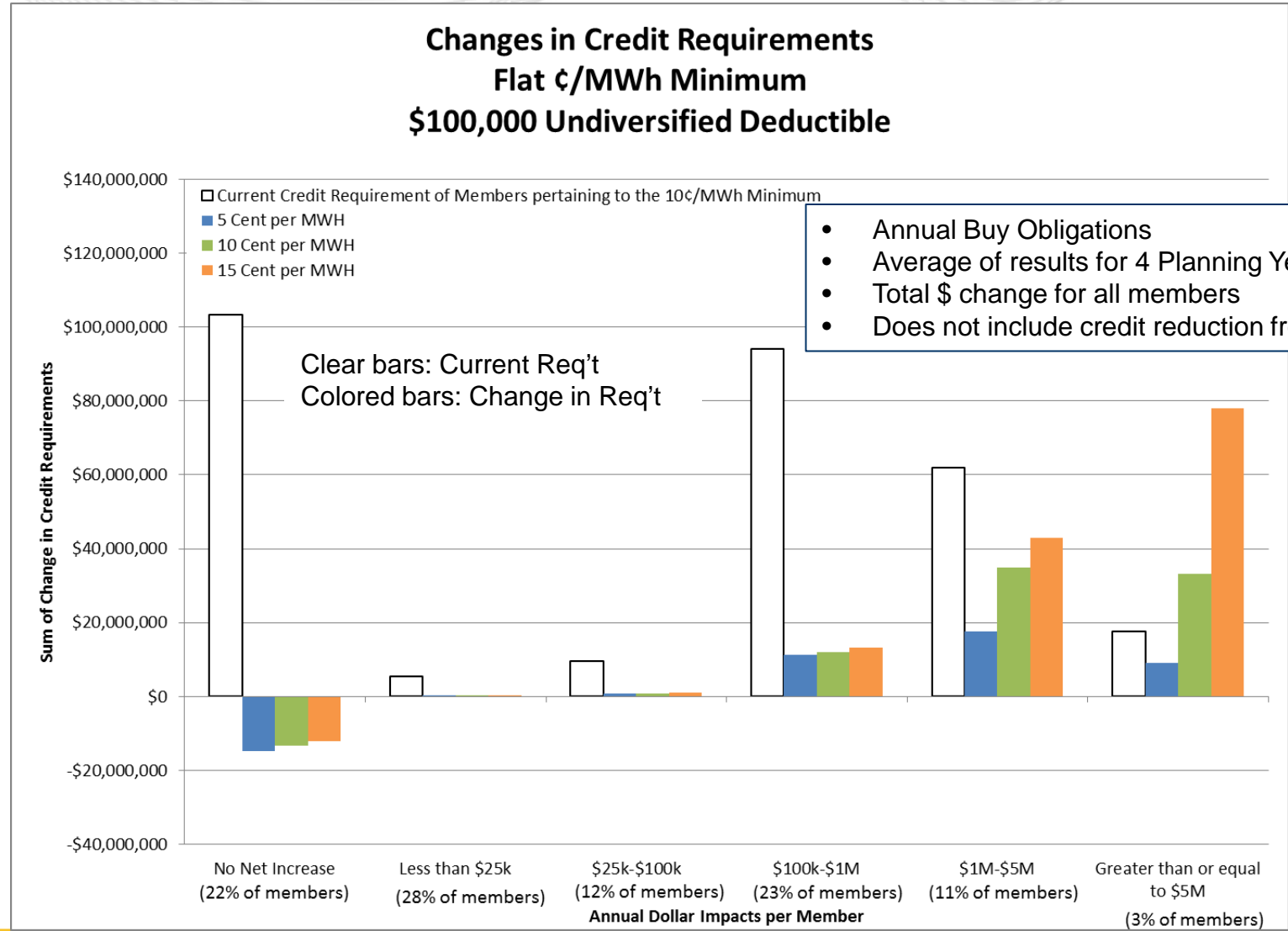
- As expected, dollar impact is concentrated in very few members



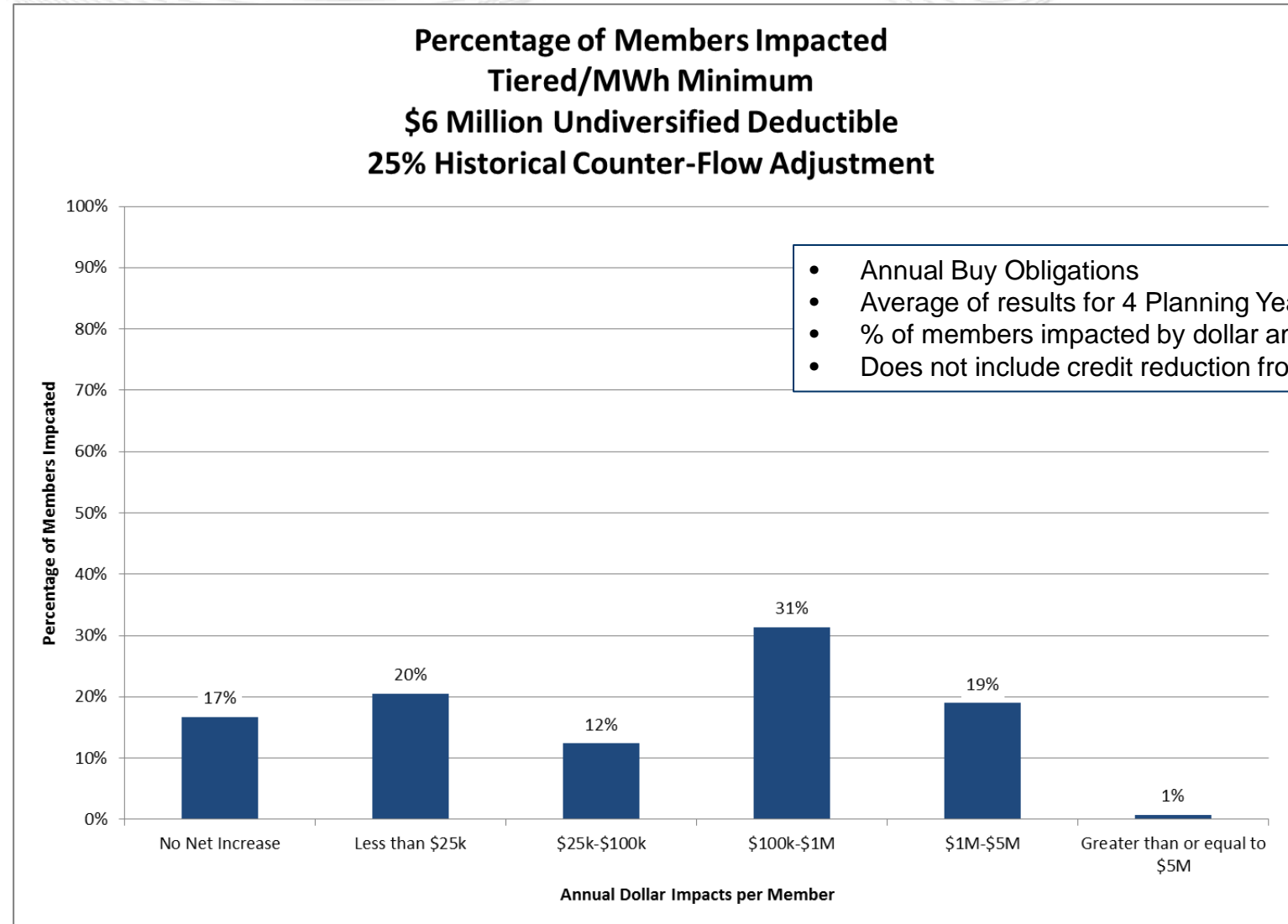
- The \$100K/month Undiversified deductible doubled the number of members experiencing no increase



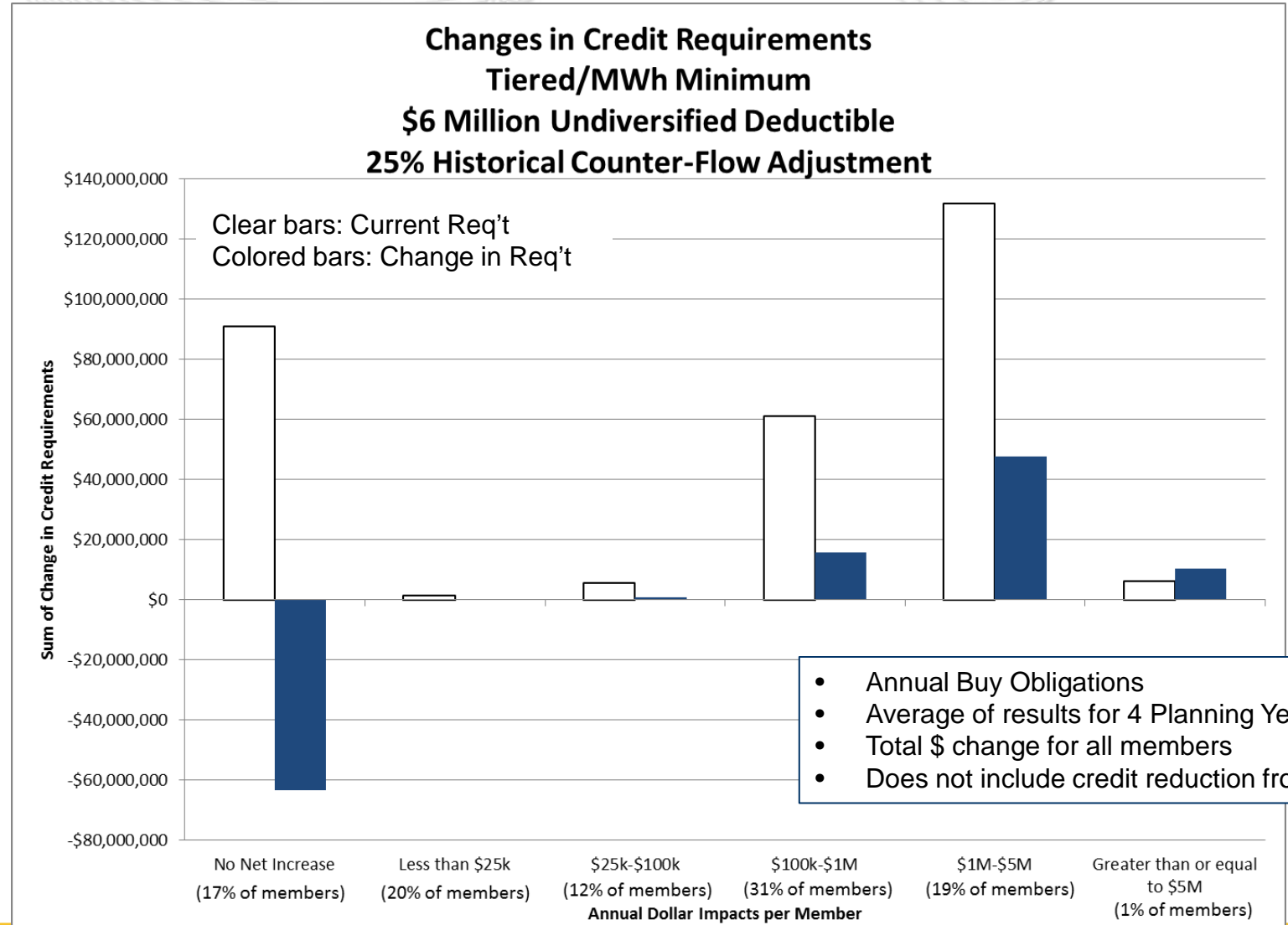
- The Undiversified deductible also significantly decreased credit requirements for some members
- Reductions in total requirements show that a per-MWh minimum is not a substitute for the Undiversified Adder



- Distribution of impacts (by dollar impact groups) seems similar to the options with a flat per-MWh minimum
- 37% would have no increase or less than \$25,000 for the whole planning year
- 50% would have a total increase under \$100,000

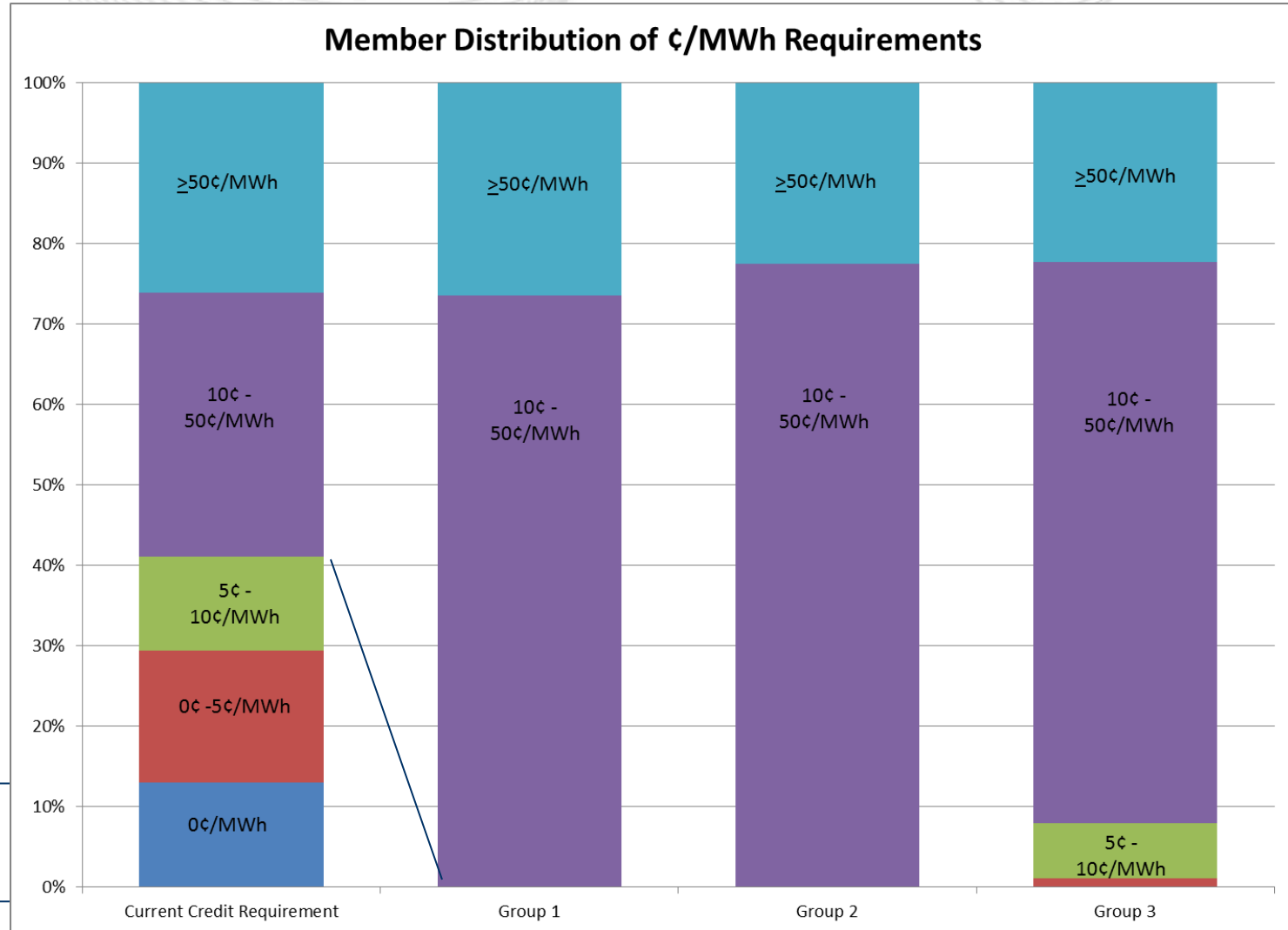


- But the actual dollar amounts are significantly different
- Many members lose most of their credit requirement
- Larger portfolios do not see the same increase as with a flat minimum
- A per-MWh minimum is not a substitute for the Undiversified Adder



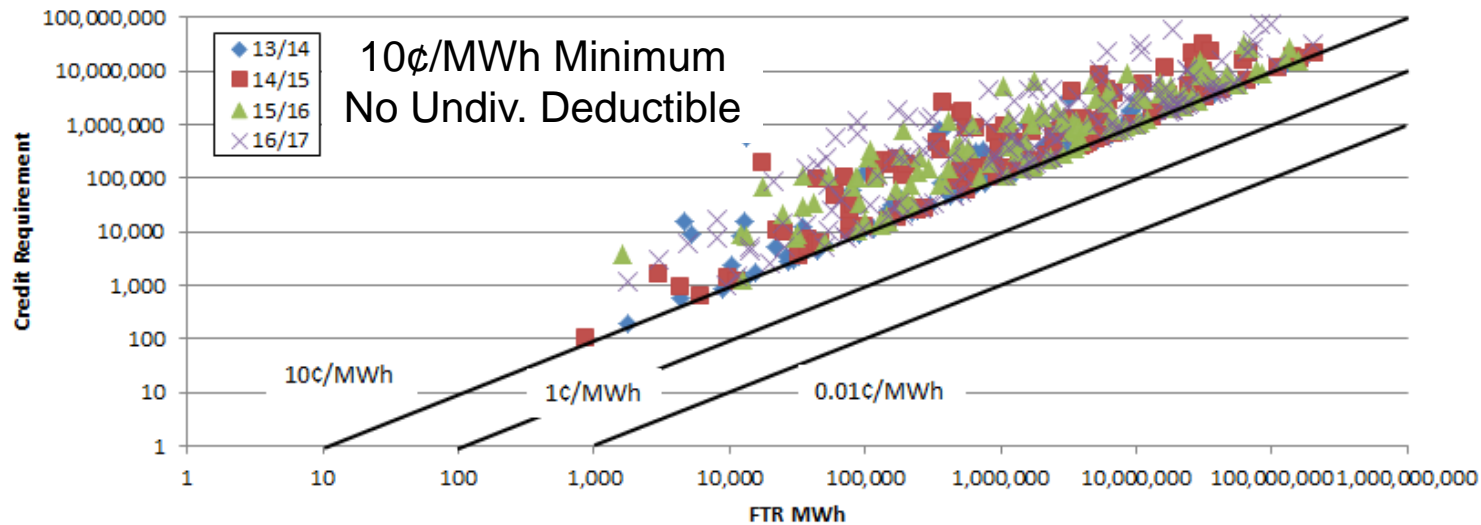
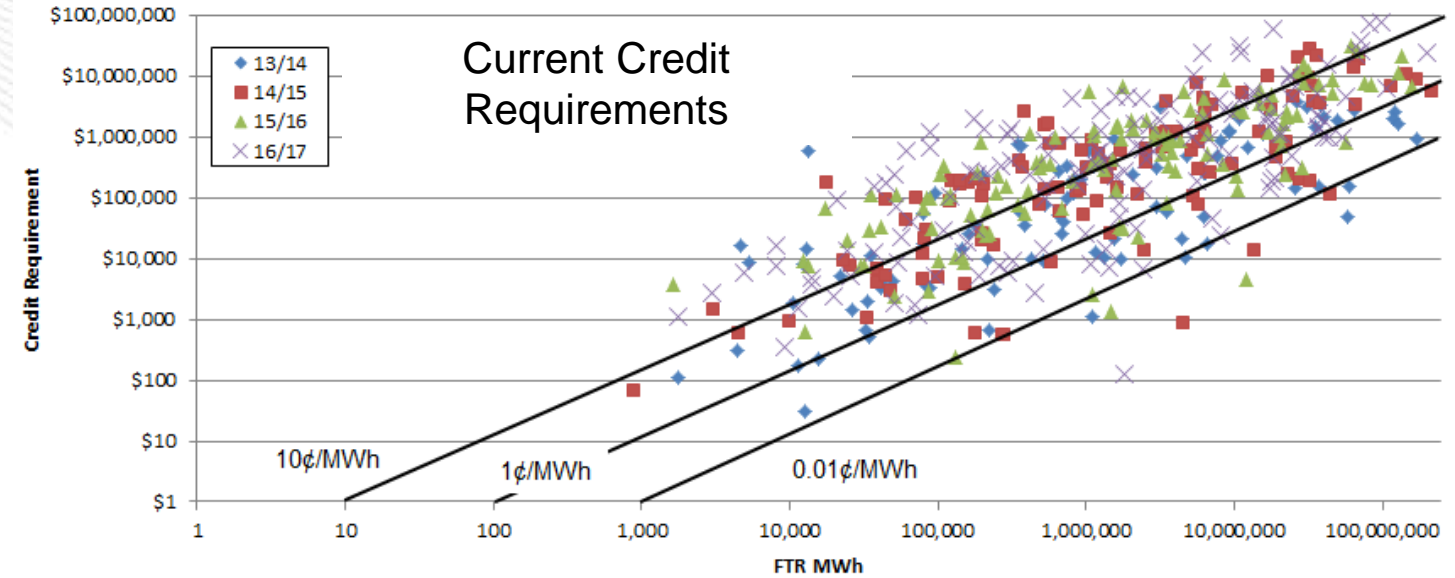
- A tiered minimum can leave a large portfolio with a small per-MWh requirement
 - Not possible with a flat minimum
- Under the flat per-MWh minimum options, all members have a credit requirement of at least the minimum.

Member Distribution of ¢/MWh Requirements



- 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.



- 10¢/MWh minimum requirement
- PJM can support either a zero undiversified deductible or a \$100,000/month deductible
- No change to the 10% Historical Adjustment Factor
- ARRs would continue to provide an offset to monthly credit requirements

- In keeping with the proposed deadline for this issue charge:

CS
June 4 – First Read June 15 - Endorsement



MIC
June 6 – Introduction July 11- First Read August 8 - Endorsement

- Continued analysis and discussion of additional options
 - Undiversified adder
 - Volatility
 - Path correlations
 - Path-specific counterflow adders
 - Mark to Market
 - FTR minimum capitalization requirements

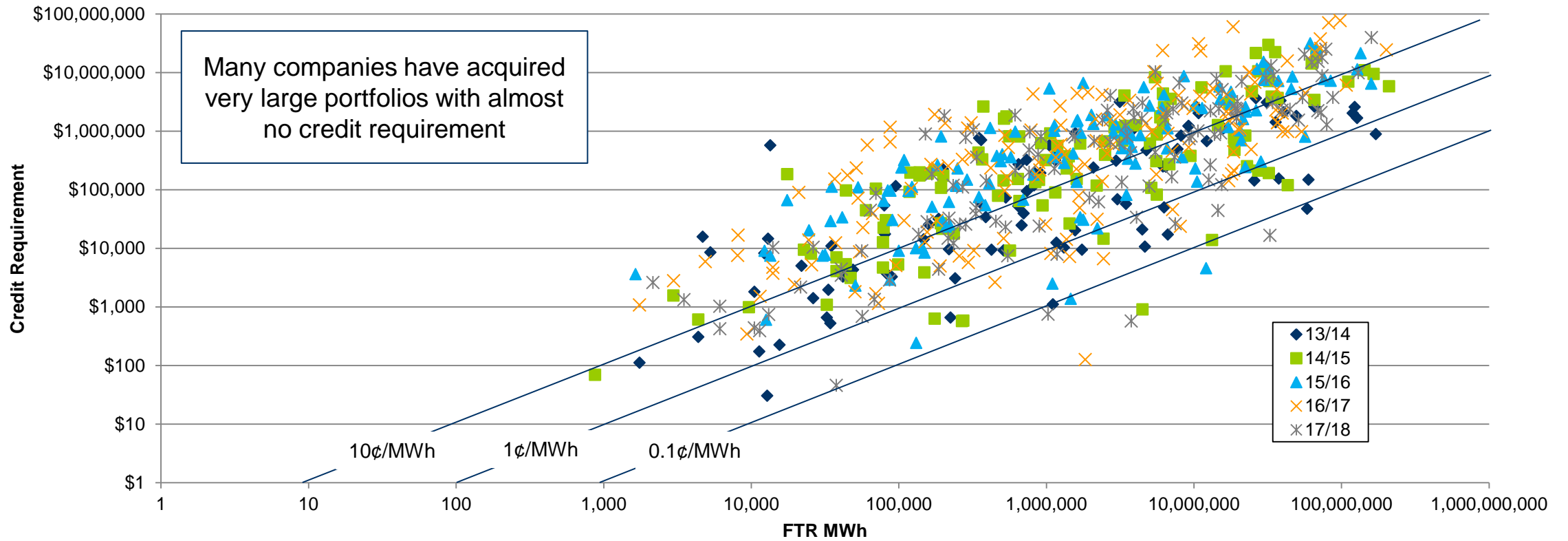
Appendix 1

Reference

- In order to minimize defaults, credit requirements normally greatly exceed expected loss amounts, resulting in excess collateral greatly exceeding loss amounts
 - Futures markets use 97% probabilities in credit design
 - Including a baseline credit requirement that is volume dependent
- In addressing the stated objectives of the issue charge, it may be necessary to increase credit requirements
 - However, PJM will continue to look for ways to improve credit efficiency, in order to minimize the overall credit requirements

- Minimum requirements will, by definition, increase credit requirements, but only for members with current low requirements relative to their FTR volume
- Changes to the Undiversified adder will, by definition, decrease credit requirements, but only for portfolios with net counterflow costs

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



Appendix 2

FTR Credit Requirement Calculations

- The FTR credit requirement starts with a monthly credit requirement calculated for each FTR
 - Monthly price minus discounted historical value for each month for each FTR
 - Historical value is the weighted average of the path congestion value over the past three years (50%-30%- 20%), on a monthly basis
 - 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.
- ARR credits in the account are subtracted from credit requirements each month
- An undiversified adder, if applicable, is applied on a monthly basis (explained in more detail on next slide)
- The total credit requirement for an account is the sum of all positive monthly subtotals

- 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 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
 - Total month credit requirement may still be negative if underlying is sufficiently negative
 - Total credit requirement is recalculated and one-day collateral call issued if needed

Appendix 3

Analysis Process

- Data gathered for four planning years
 - 13/14, 14/15, 15/16, 16/17
 - 16/17 planning year used for initial analysis
- Analysis includes all positions in the planning year
 - Annual, monthly and long-term FTRs Obligations, and ARRs
 - Shows actual total exposure to PJM membership

- Collateral excess and shortfall are measured by account on a runout (“to go”) basis
 - Equal to remaining collateral requirement minus remaining actual net loss (if any)
- Excess is the smallest positive difference
- Shortfall is the largest negative difference
- Accounts will have either a shortfall or an excess in a given year
- PJM looked at total excesses and shortfalls across all accounts for each scenario

Example Account A: \$10,000 Shortfall

Month	Monthly Credit Requirement	Monthly Profit / (Loss)	Run-Out Credit Requirement	Run-Out Profit / (Loss)	Excess/ (Shortfall)
Jun	\$10,000	\$5,000	\$120,000	(\$40,000)	\$80,000
Jul	\$10,000	\$5,000	\$110,000	(\$45,000)	\$65,000
Aug	\$10,000	\$5,000	\$100,000	(\$50,000)	\$50,000
Sep	\$10,000	\$5,000	\$90,000	(\$55,000)	\$35,000
Oct	\$10,000	\$5,000	\$80,000	(\$60,000)	\$20,000
Nov	\$10,000	\$5,000	\$70,000	(\$65,000)	\$5,000
Dec	\$10,000	(\$20,000)	\$60,000	(\$70,000)	<u>(\$10,000)</u>
Jan	\$10,000	(\$20,000)	\$50,000	(\$50,000)	\$0
Feb	\$10,000	(\$20,000)	\$40,000	(\$30,000)	\$10,000
Mar	\$10,000	(\$20,000)	\$30,000	(\$10,000)	\$20,000
Apr	\$10,000	\$5,000	\$20,000	\$10,000	\$20,000
May	\$10,000	\$5,000	\$10,000	\$5,000	\$10,000

Example Account B: \$10,000 Excess

Month	Monthly Credit Requirement	Monthly Profit / (Loss)	Run-Out Credit Requirement	Run-Out Profit / (Loss)	Excess/ (Shortfall)
Jun	\$10,000	\$5,000	\$120,000	(\$20,000)	\$100,000
Jul	\$10,000	\$5,000	\$110,000	(\$25,000)	\$85,000
Aug	\$10,000	\$5,000	\$100,000	(\$30,000)	\$70,000
Sep	\$10,000	\$5,000	\$90,000	(\$35,000)	\$55,000
Oct	\$10,000	\$5,000	\$80,000	(\$40,000)	\$40,000
Nov	\$10,000	\$5,000	\$70,000	(\$45,000)	\$25,000
Dec	\$10,000	(\$20,000)	\$60,000	(\$50,000)	<u>\$10,000</u>
Jan	\$10,000	(\$20,000)	\$50,000	(\$30,000)	\$20,000
Feb	\$10,000	(\$20,000)	\$40,000	(\$10,000)	\$30,000
Mar	\$10,000	\$0	\$30,000	\$10,000	\$30,000
Apr	\$10,000	\$5,000	\$20,000	\$10,000	\$20,000
May	\$10,000	\$5,000	\$10,000	\$5,000	<u>\$10,000</u>

- Factors analyzed for possible adjustments to the credit calculation
 - Per MWh Minimum Requirements (applied monthly)
 - Flat rate
 - Tiered
 - Undiversified Adder deductible
 - Prevailing and Counter Flow Historical Value Adjustments
 - Volatility

- Per MWh Minimum Requirement
 - Single adder in single increments
 - \$0.03, \$0.05, \$0.07, \$0.10, \$0.20, and \$0.30 per MWh
 - Tiered approach analyzed*:

Cleared MWh	Marginal Credit Rate
	\$0.50 Tiered*
First 1MM MWh/Mo	\$0.50/MWh
1 MM – 10 MM MWh/Mo	\$0.25/MWh
10 MM – 100 MM MWh/Mo	\$0.10/MWh
Above 100 MM MWh/Mo	\$0.01/MWh

* Stakeholder proposal