UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)	Docket No. ER22-2029-000

MOTION TO LODGE AND
PROTEST OF THE ORGANIZATION OF PJM STATES, INC.

Pursuant to Rules 211 and 212 of the Federal Energy Regulatory Commission's ("FERC" or "Commission") Rules of Practice and Procedure, 18 C.F.R. § 385.211 and 385.212, the Organization of PJM States, Inc. ("OPSI"),[1] respectfully submits this Motion to Lodge and Protest in opposition to PJM Interconnection, L.L.C.'s ("PJM") proposed changes to its Open Access Transmission Tariff ("Tariff") filed on June 3, 2022.[2] PJM writes, "The Tariff changes in this filing are the same as those PJM presented in its December 2021 FPA section 205 filing in Docket No. ER22-703-000, which the Commission found unsupported."[3] OPSI requests the Commission find, yet again, that PJM's filing is deficient because the additional analysis PJM includes in its June 2022 filing makes its proposal no more just and reasonable than the previous proposal the Commission has already rejected. The Commission should find the filing in this docket unsupported by the record and continue to review PJM's Financial Transmission Rights ("FTR") market in Docket No. EL22-32 to ensure it remains just and reasonable.[4]

[1] Approved by the following OPSI members: Delaware PSC, District of Columbia PSC, Illinois CC, Indiana URC, Kentucky PSC, Maryland PSC, Michigan PSC, New Jersey BPU, North Carolina UC, Pennsylvania PUC, Tennessee PUC, Virginia SCC, and PSC of West Virginia on June 24, 2021. The PUC of Ohio abstained in the vote on this filing.
[2] PJM Interconnection, L.L.C, "Revisions to PJM's FTR Credit Requirement" Docket No. ER22-2029 (June 3, 2022) ("June Filing").
[3] *Id*. at 2 (citations omitted).
[4] PJM Interconnection, L.L.C.,178 FERC ¶ 61,146 (2022) ("February Order").

I. MOTION TO LODGE

OPSI moves to lodge[5] its Comments[6] and Answer[7], and the expert testimony accompanying PJM's December 2021 proposal[8] filed in Dockets No. ER22-703-000 and ER22-703-001 in this record. The Commission has the discretion to grant a motion to lodge information from other proceedings upon a finding of good cause.[9] Generally, the Commission finds good cause to grant a motion to lodge where the information will supplement the record in the proceeding and may assist the Commission in the decision-making process.[10]

PJM's expert testimony and OPSI's previous filings in Dockets ER22-703-000 and ER22-703-001 are highly relevant to the proceeding at hand as they address the exact same issues in dispute in this proceeding, namely PJM's proposal to adopt a 97% Confidence Interval ("CI") as part of its FTR Credit Requirement. PJM does not dispute that its filing is the same as before, therefore, the Commission should consider OPSI's previous positions and PJM's previously provided expert testimony as it considers the proposal PJM has filed in this docket.

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[5] This motion is submitted pursuant to Rule 212 of FERC's Rules of Practice and Procedure, 18 C.F.R. § 385.212 (2022).

[6] PJM Interconnection L.L.C., "Comments of the Organization of PJM States, Inc.," Dockets No. ER22-703-000 and ER22-703-001 (January 14, 2022) ("OPSI Comments"). See Attachment A.

[7] PJM Interconnection L.L.C., "Motion for Leave to Answer and Answer of Organization of PJM States, Inc. in Opposition to the PJM Interconnection, L.L.C. Request for Rehearing", Dockets No. ER22-703-000 and ER22-703-001 (April 12, 2022). ("OPSI Answer"). See Attachment A.

[8] PJM Interconnection, L.L.C, "Revisions to PJM's FTR Credit Requirement and Request for 28-Day Comment Period", Docket No. ER22-703, Affidavit of Dr. Alex Eydeland on Behalf of PJM Interconnection, L.L.C. (Attachment G) ("Eydeland Aff.") and Affidavit of Neal Wolkoff and Robert Anderson on Behalf of PJM Interconnection, L.L.C. at 22-23 (Attachment D) ("Wolkoff/Anderson Aff.") (December 21, 2021) ("December Filing"). See Attachment A.

[9] *See, e.g.*, High Prairie Pipeline, LLC v. Enbridge Energy, LP, 149 FERC ¶ 61,004, at P 34 (2014); Xcel Energy Southwest Transmission Co., 149 FERC ¶ 61,182, at P 63 (2014); Public Serv. Co. of New Hampshire and New England Power Co., 56 FERC ¶ 61,105, at 61,403 (1991).

[10] *See* Consumers Energy Co. v. Midcontinent Indep. Sys. Operator, Inc., 167 FERC ¶ 61,212, at P 11 (2019) ("Motions to lodge information from other proceedings may be appropriate in some instances to supplement the Commission's record."); *see, e.g.*, Indep. Power Producers of N.Y., Inc., 150 FERC ¶ 61,214, at P 63 (2015) (accepting motions to lodge because the documents provided aided in the Commission's disposition of matters raised in the complaint); Xcel Energy Southwest Transmission Co., 149 FERC ¶ 61,182, at PP 9, 63 (2014) (accepting motion to lodge providing information that assisted FERC in its decision-making process).

II. BACKGROUND

On December 21, 2021, PJM filed tariff revisions to revise the calculation of its FTR Credit Requirement.[11] In that filing, PJM proposed to use a historical simulation ("HSIM") model to produce a probability distribution of different potential exposure values[12] and "initially" a 97% CI.[13] PJM described how it advocated for a 99% CI during the stakeholder process, how this "was a topic of discussion and dispute," and how it "was willing to use a 97% CI as part of the major step forward."[14] OPSI noted PJM's advocacy for and intent to file a 99% CI *eventually* but pointed out how PJM sought approval for a 97% CI *immediately*.[15] OPSI wrote that PJM's plan did not describe how PJM would move from a 97% CI to a 99% CI, how long this would take, and how PJM's proposal would adequately protect electric customers from default risk in the FTR market.[16] OPSI asked the Commission to find the filing deficient until PJM provided these details.[17] The Commission agreed with OPSI and found PJM's proposal unsupported by the record.[18] PJM's independent auditors validated the HSIM model at a 99% CI, and PJM did not explain how this showed that a 97% CI would operate similarly under extreme events or cover losses as expected.[19] OPSI has previously described what a transition from a 97% CI to a 99% CI could look like.[20] PJM's proposal in its June 2022 filing continues to provide no such clarity.

In its December filing, PJM also described the limitations of its existing process,[21] and

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[11] December Filing.
[12] Eydeland Aff. at 3.
[13] *Id*. at 10 and §1.B.
[14] *Id*. at 10.
[15] OPSI Comments at fn. 15.
[16] *Id*. at 6.
[17] *Id*.
[18] February Order at P 31.
[19] *Id*. at P 32.
[20] OPSI, Letter to the PJM Board of Directors at 2 (Nov. 10, 2021) *available at:* https://opsi.us/wp-content/uploads/2021/11/2021-11-09-OPSI-Letter-Initial-Margin.pdf.
[21] December Filing at § I.B.

this led the Commission to find that these limitations may indicate PJM's current FTR Credit Requirement is not just and reasonable. The Commission initiated an investigation pursuant to § 206 of the Federal Power Act[22] ("FPA") to examine the justness and reasonableness of PJM's existing FTR requirement.[23] The Commission directed PJM to respond in 60 days showing how its existing FTR Credit Requirements remain just and reasonable or explain what changes would remedy these deficiencies if the Commission finds them to be unjust and unreasonable.[24] The Commission also said it would allow PJM to request this § 206 proceeding be held in abeyance while PJM proposed a new FPA § 205 filing.[25] PJM requested the Commission hold EL22-32-000 in abeyance[26] so that it could submit the current filing before the Commission now.[27]

III. ARGUMENT

The bulk of PJM's justification to again ask the Commission to approve a 97% CI rests on additional analyses it performed, including a cost-benefit analysis that "*was not available at the time of its original filing"*, which supports this filing as just and reasonable and addresses each of the Commission's concerns raised in the February 28 Order."[28] It should be noted that PJM itself conducted this cost-benefit analysis – not an independent, third-party.[29] In the instant filing, PJM claims that its cost-benefit and related analyses make clear that the objective of protecting PJM and its Members against the risk of FTR portfolio losses can be "substantially" (but not fully) achieved at a 97% CI at significantly less cost to PJM members.[30] PJM states that

[22] 16 U.S.C. § 824e (2021).
[23] February Order at PP 31, 35.
[24] *Id*. at P 35.
[25] *Id*. at P 38.
[26] PJM Interconnection L.L.C., "Motion to Hold Section 206 Proceeding in Abeyance," Docket EL22-32 (May 31, 2022).
[27] June Filing.
[28] *Id*. at 2 (Emphasis added).
[29] Draushak Aff. at 14, Eydeland Aff. at 9.
[30] June Filing at 3.

a 97% CI could result in a yearly shortfall of $27.5M compared to a 99% CI but that a 99% CI would reduce FTR Market Participants' available capital by $22.4 million to $46.8 million.[31] PJM calculated this $27.5 million shortfall by using different probabilities of financial default which were then assigned to each member using default allocation assessment percentages.[32] PJM expects these default allocation assessment percentages to change over time.[33] Importantly, however, PJM does not explain why portfolio losses or even defaults cannot regularly exceed this average incremental annual amount.

PJM also attempts to suggest that the 97% CI is not the driver of reduced collateral compared to the status quo, pointing instead to other proposed revisions to its FTR Credit Requirement including the elimination of the undiversified adder and allowing Mark-To-Auction ("MTA") adjustments to reduce (instead of only increasing) the FTR Credit Requirement.[34] However, its filing makes clear that a 99% CI would drive a $585.3 million increase in collateral when compared to a 97% CI.[35] According to PJM and its cost-benefit analysis, this increase in collateral is not commensurate to the benefits conferred by the increased collateral required at a 99% CI.[36] However, this argument rings truer as an attempt to let FTR market participants keep more of their capital free to deploy elsewhere rather than collateralized to provide sufficient protection to the PJM customers who continue to bear the outsized risk for the next GreenHat default. The Commission cannot decide that a market construct is just and reasonable based on

[31] *Id*. at 21.
[32] *Id*. Drauschak Aff., Exhibit C.
[33] *Id*.
[34] *Id*. at 30, Drauschak Aff. at 23.
[35] *Id*. at 20.
[36] June Filing at 3, 16-19.

whether it protects PJM and its Members without also analyzing how protecting PJM and its members protects customers. The FPA is a *consumer* protection statute.[37]

PJM writes that moving from a 97% CI to a 99% CI would require Members that serve load to hold a greater amount of collateral than other Members, presumably suggesting that customers would be better off if those entities did not have to provide this increased amount of collateral.[38] Aside from the ambiguity in how exactly PJM determined the cost per member sector, PJM assumes that no members who serve customers also hold positions for profit-making purposes, not dissimilar from Financial Traders. It would be implausible to suggest that if a company that happens to serve load were to find profit-making opportunities unrelated to hedging against congestion in the interest of their customers they would decline to capitalize on those opportunities. Further, some members may have cross-sector interests but opt to identify under a specific membership sector for voting purposes further complicating this analysis. Regardless, it is unclear how much customers would actually save if PJM collected less collateral and how much risk they would assume if Members serving load pass on costs to cover the default to ratepayers – especially if the conditions come to pass that PJM's independent experts contemplate in their testimony.[39]

Ultimately, it is the *size* of any possible default which continues to represent a significant downside risk to retail customers, not the profitability of FTR Market Participants. This risk is not sufficiently mitigated simply through PJM's "Know Your Customer" set of reforms which

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[37] *See, e.g.*, Pa. Water & Power Co. v. FPC, 343 U.S. 414, 418 (1952); New England Power Generators Ass'n v. ISO New England Inc., 146 FERC ¶ 61,038 at P 26 & n.33 (2014); *See* Atlantic Refining Co. v. Public Service Comm'n, 360 U.S. 378, 388-389, 79 S.Ct. 1246 (1959); FPC v. Hope Natural Gas Co., 320 U.S. 591, 610-612, 64 S.Ct. 281, (1944); Mun. Light Boards of Reading & Wakefield, Mass. v. Fed. Power Comm'n, 450 F.2d 1341, 1348 (D.C. Cir. 1971) ("Its primary aim is the protection of consumers from excessive rates and charges.").

[38] June Filing at § II.C.1.b.

[39] December Filing, Affidavit of Neal Wolkoff and Robert Anderson on Behalf of PJM Interconnection, L.L.C. at 22-23 (Attachment D) ("Wolkoff/Anderson Aff.").

apparently serves to lower the counterparty risk of individual market participants,[40] but which do not lessen any ultimate default amount. PJM's recitation of its "multiple tools to assess and mitigate participant risk" does not support this filing as just and reasonable.[41] Indeed, these are the tools PJM had at its disposal leading up to the Hill Energy default and were in PJM's governing documents when the Commission previously found PJM's 97% CI proposal as not just and reasonable. Merely pointing to their existence now does nothing to support the current filing or provide OPSI any comfort that they will be used to reduce defaults and protect customers.

To repeat from OPSI's previous Protest, PJM's expert consultants – the very same consultants PJM refers to in this filing[42] who provided PJM recommendations related to collateral requirements indicated:

> By design, a 97% CI in the FTR Credit Requirements will allow for potentially more inadequate margin scenarios which may result in more uncovered losses to the *PJM markets as a whole* and to the PJM members, including those that do not actively participate in the FTR markets…. Unfortunately, in the PJM markets that are inextricably tied to the physical power markets, the 3% tail which is uncovered may include an extreme weather event like a polar vortex or a Winter Storm Uri event which foreseeably could re-occur. Such extreme but foreseeable events can result in significant commodity derivatives market price swings, which may cause FTR market defaults, which may generate disproportionately large losses which PJM's members do not have the resources to bear. By missing 3% of the outlying events of the past using a 97% CI when setting a protective Initial Margin level, the 97% CI choice knowingly exposes the FTR markets to foreseeable price moves that are not covered by the level of required Initial Margin. Even while the market proceeds without any defaults, the *PJM markets as a whole* and members of PJM (*including non-participants* in the FTR market) are effectively providing credit support to FTR market participants by *agreeing to backstop losses* resulting from a failure in FTR market margin policy.[43]

[40] ER22-2029-000, PJM Draushak Testimony at 24 (June 3, 2022).
[41] June Filing at 36.
[42] *Id*. at 10.
[43] Wolkoff/Anderson Aff. at 22-23.

This concern, coupled with PJM's former independent Chief Risk Officer ("CRO"), just three months ago, calling attention to the extreme volatility and illiquidity in the markets,[44] only further validates the need to adopt the universally recognized minimum 99% CI employed by Derivatives Clearing Organizations ("DCOs") and other Market Risk Managers (e.g. ERCOT, Nodal, and ICE). Yet, PJM's filing attempts to overlook the extreme yet foreseeable events that can cause significant market swings and which may not be covered by a 97% CI.

While the independent CRO position at PJM[45] – a much needed role following the GreenHat default – has been vacated, the Commission should not dismiss the concerns articulated by PJM's former independent CRO as far back as last fall when stakeholders were similarly positioning to adopt a substandard collateral level.[46] Even then, the independent CRO warned of energy commodity prices at levels not seen since the 2008 Recession and increasing price volatility among several of concerns that necessitate a move to a 99% CI. As the economy continues this trend, it is important – now more than ever – to heed these concerns. The Acting Chief Risk Officer that supports this filing also serves as CFO and does not, to OPSI's knowledge, report directly to the PJM Board. This is an important distinction given the CRO position is expected to receive board-level oversight and that certain stakeholders remain resistant to adopting anything but a substandard collateral requirement. In deference to this

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[44] PJM, "Initial Margin Next Steps" at 5 (March 23, 2022) *available at:* https://pjm.com/-/media/committees-groups/committees/mc/2022/20220323/20220323-item-01a-1-initial-margin-filing-next-steps-presentation.ashx.

[45] PJM, "PJM Interconnection Announces New Chief Risk Officer" (July 22, 2019) ("PJM's CRO, Bloczynski will oversee all aspects of PJM's risk function, including credit and collateral policies, market surveillance, monitoring of market-participant behavior, and both qualitative and quantitative analytics. The Risk and Audit Committee of the PJM Board of Managers will oversee Bloczynski, who joins the company July 29. This elevated, board-level oversight reflects PJM's objective to further instill the importance of risk management throughout the organization.") *available at:* https://www.pjm.com/-/media/about-pjm/newsroom/2019-releases/20190722-pjm-hires-cro.ashx.

[46] PJM, "PJM Perspectives on Main Motion and Initial Margin" (October 14, 2022) *available at*: https://www.pjm.com/-/media/committees-groups/committees/mc/2021/20211020/20211020-item-01b-pjm-perspectives-on-main-motion-and-initial-margin.ashx.

insistence, PJM now seeks to "find" new evidence to produce a cost-benefit argument that makes the underlying proposal no more just and reasonable than before.

Even though it is clear PJM's proposal is objectively substandard, the RTO is again advocating for a proposal exclusively because a majority of members support it. This deference to certain stakeholders, even on proposals PJM acknowledges are substandard,[47] raises concerns of a systemic misalignment with the principles in Order No. 2000 that foster lighter-handed regulations.[48] This misalignment speaks further to the unjustness and unreasonableness of the current proposal.

IV. CONCLUSION

Once again, OPSI asserts that PJM's proposal for a 97% CI falls short of adequately protecting consumers from a market they likely receive far less benefit from than they bear the risk of default for. A 99% CI for FTRs is appropriate and necessary as the prevailing industry standard and should be the minimum standard adopted by PJM. The 99% CI was originally supported by PJM management, its independent, board-supervised CRO, and the independent experts hired by PJM. A 99% CI is used by the CFTC, DCOs, and other market risk managers.[49] Despite the analyses and new evidence which PJM claims support its 97% CI proposal, PJM has not met its evidentiary burden to show how this proposal protects electric customers pursuant to the FPA.

The Commission was correct to reject the December filing and open a Section 206 investigation into the justness and reasonableness of PJM's current FTR Credit Requirements,

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[47] *See* OPSI Comments at 4-5 citing December Filing at 10.

[48] *Regional Transmission Organizations*, Order No. 2000, 89 FERC ¶ 61,285 at 96-99 (1999) ("Order 2000") (1999) ("Order 2000"), order on reh'g, Order No. 2000-A at 99-101 (2000).

[49] Absent an agreement between CFTC and FERC on the regulation of these markets, they would be regulated by CFTC and would most likely require a 99% CI. *See* OPSI Comments at 2.

and it should reach the same conclusion here. As such, OPSI requests that the Commission find PJM's filing deficient, as it is still unsupported by the evidence in the record.

Respectfully Submitted,

/s/ Gregory V. Carmean
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Dated: June 24, 2022

CERTIFICATE OF SERVICE

I hereby certify that the foregoing has been served in accordance with 18 C.F.R. Section 385.2010 upon each person designated on the official service list compiled by the Secretary in this proceeding.

/s/ Gregory V. Carmean

Executive Director
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Dated at Newark, Delaware this June 24, 2022.

ATTACHMENT A

1. PJM Interconnection L.L.C., "Comments of the Organization of PJM States, Inc., Dockets No. ER22-703-000 and ER22-703-001, (January 14, 2022).

2. PJM Interconnection L.L.C., "Motion for Leave to Answer and Answer of Organization of PJM States, Inc. in Opposition to the PJM Interconnection, L.L.C. Request for Rehearing", Dockets No. ER22-703-000 and ER22-703-001 (April 12, 2022).

3. PJM Interconnection, L.L.C, "Revisions to PJM's FTR Credit Requirement and Request for 28-Day Comment Period", Docket No. ER22-703, Affidavit of Neal Wolkoff and Robert Anderson on Behalf of PJM Interconnection, L.L.C. (Attachment D) ("Wolkoff/Anderson Aff.") and Affidavit of Dr. Alex Eydeland on Behalf of PJM Interconnection, L.L.C. (Attachment G) ("Eydeland Aff.") (December 21, 2021).

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)	Docket No.	ER22-703-000
	)		ER22-703-001
	)		

COMMENTS OF THE
ORGANIZATION OF PJM STATES, INC.

Pursuant to Rule 212 of the Federal Energy Regulatory Commission's ("FERC's" or the "Commission's") Rules of Practice and Procedure, the Organization of PJM States, Inc. ("OPSI"),[1] respectfully submits the following comments regarding the proposed changes to the PJM Interconnection, L.L.C. ("PJM") Open Access Transmission Tariff ("Tariff") filed on December 21, 2021[2] and amended on December 30, 2021[3] (together, "PJM Filing"), pursuant to section 205 of the Federal Power Act ("FPA")[4] and part 35 of the Commission's regulations.[5] The PJM Filing proposes to revise the calculation of the Financial Transmission Right ("FTR") Credit Requirement, which sets the collateral in order to participate in PJM's FTR market. OPSI requests the Commission find the PJM Filing deficient.

I. COMMENTS

[1] Approved unanimously by the OPSI Board of Directors on January 13, 2022.
[2] *PJM Interconnection, L.L.C, Revisions to PJM's FTR Credit Requirement and Request for 28-Day Comment Period* (December 21, 2021) ("December 21 Filing").
[3] *PJM Interconnection, L.L.C., Amendment to Revisions to PJM's FTR Credit Requirement*, (PJM filed to amend its initial filing since it "inadvertently included two errors to the [proposed] Tariff language … ." PJM's amended filing did not offer any changes to the supporting documents included in the initial filing.) (December 30, 2021).
[4] 16 U.S.C. § 824d.
[5] 18 C.F.R. part 35.

OPSI appreciates PJM's efforts to instill confidence in its financial markets since the GreenHat Energy, LLC ("GreenHat") default of June 21, 2018. The PJM Board contracted with an independent consultant providing numerous recommendations for improvement[6] that have led to the hiring of a Chief Risk Officer and the most recent PJM stakeholder efforts to reform FTR market rules. These efforts have culminated in a proposed suite of changes, including those aimed at reducing default risk compared to the status quo. Included in the PJM Filing is a provision to calculate Initial Margin ("IM") at a level that meets a 97% Confidence Interval ("CI") – significantly below the 99% minimum established for swaps[7] by the Commodity Futures Trading Commission ("CFTC").[8] The 99% CI threshold was equally embodied in the policy framework developed by the Basel Committee on Banking Supervision ("BCBS") and the Board of the International Organization of Securities Commissions ("IOSCO") upon the urging of the Group of Twenty ("G20") in 2011 to develop consistent global standards.[9]

The CFTC has exempted FTRs from the provisions of the Commodity Exchange Act[10] and PJM's FTR market does not fall under the jurisdiction of similar international regulatory agencies. Yet, it is incumbent upon the Commission as the regulator of this market to protect integrated utilities and Load Serving Entities ("LSEs") from uncovered losses that, either directly

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[6] *Report of the Independent Consultants on the GreenHat Default*, Independent Consultants R. Anderson and N. Wolkoff, Counsel for the Special Committee: A. P. Helfer III, Esq., Schnader Harrison Segal & Lewis LLP (March 26, 2019).

[7] *Impacts of Potential Financial Markets Reform Legislation on Organized Wholesale Electricity Markets*, Testimony of V. P. Duane, Vice President & General Counsel PJM Interconnection, L.L.C. before the United States Senate Committee on Energy Committee on Energy and Natural Resources, at 6 ("The FTR is a forward right or obligation with some attributes seen in swap contracts and other attributes seen in futures contracts.") (March 9, 2010).

[8] *Margin Requirements for Uncleared Swaps for Swap Dealers and Major Swap Participants, Final Rule*, CFTC, 17 CFR Parts 23 and 140, Federal Register Vol. 81, No. 3 (January 6, 2016).

[9] *Margin Requirements for Non-Centrally Cleared Derivatives*, BCBS and IOSCO (September 2013).

[10] *Final Order in Response to a Petition from Certain Independent System operators and Regional Transmission Organizations to Exempt Specified Transactions Authorized by a Tariff or Protocol Approved by the Federal Energy Regulatory Commission or Public Utility Commission of Texas from Certain Provisions of the Commodity Exchange Act Pursuant to Authority Provided in the Act*, CFTC, Federal Register Vol. 78, No. 63 (April 2, 2013).

or indirectly, are eventually passed along to electric ratepayers. The PJM Filing does not demonstrate how the selected 97% CI serves in addressing any potential impact on the liquidity resources of FTR Market participants compared with a 99% CI. Moreover, it certainly does not provide any detail regarding such impacts vis-à-vis the need to protect non-participants and ultimately, electric ratepayers from the consequences of default risk exposure. Furthermore, the PJM Filing does not provide the pertinent information necessary for the Commission to reasonably examine these factors. Rather, PJM simply proposes to "move the Tariff's FTR credit policy *toward* credit and collateral best practices in the energy commodity and financial derivatives industry"[11] and "consider the need for further changes."[12] Short of indicating that consideration of such changes would rely on "additional data and experience gained from implementation of the present proposal, appropriate consultation with stakeholder [and] … a section 205 filing,"[13] the PJM Filing does not provide any plan, direction or timetable for, nor does it commit to reaching a desired end state that actually aligns the collateral requirement with the 99% CI used in other markets or provide any metrics that would guide it along in that direction.

Timely adoption of a 99% CI is not only critical but also predicates support for an interim 97% CI in an affidavit PJM provides in justifying its proposed Tariff changes.[14] As Affiants Wolkoff and Anderson indicate:

> PJM has told us they are committed to implementing a 99% Confidence Interval in the future…PJM also recognizes that it is not in the public interest for the FTR market to be exposed to another default resulting in losses to PJM members because

[11] December 21 Filing at 5 (emphasis added).
[12] Affidavit of Nigeria Bloczynski on Behalf of PJM Interconnection, L.L.C. at 15.
[13] *Id.*
[14] Affidavit of Neal Wolkoff and Robert Anderson on Behalf of PJM Interconnection, L.L.C., December 21, 2021 at 29 ("Our recommendation of the interim 97% Confidence Interval at this time is with the clear understanding that PJM will implement a 99% Confidence Interval within a reasonable period of time.").

> of an extended delay in moving the FTR Credit Requirements to a 99% Confidence Interval.
>
> We are supportive of using a 97% Confidence Interval as an appropriate practice at this time. We see this as an initial step toward industry best practices while avoiding market disruptions that could be caused by the transition from the old collateral system to the new Initial Margin regime, with a 99% Confidence Interval, in one step. However…we concur with PJM's expressed and appropriate intent to move diligently and on a reasonable timeframe to a 99% Confidence Interval.[15]

Affiants Wolkoff and Anderson do not explain why an immediate adoption of 99% would cause market disruptions significantly different than with a leap to a 97% CI. The Affiants are also silent on how exactly they would characterize "diligently and in a reasonable timeframe" in moving towards a 99% CI. They do, however, state that "[g]iven the lengthy period between auctions, PJM may have to wait one or two months to have sufficient price data to see that its model is not effectively capturing price risk as expected at the Confidence Interval in effect."[16] This observation suggests that a "reasonable timeframe" would be significantly shorter than PJM's above mentioned prospect of consulting stakeholders anew and filing for Commission approval under FPA section 205. This is especially of concern given Affiants Wolkoff and Anderson aptly characterize the adverse implications of maintaining a 97% CI, stating:

> By design, a 97% CI in the FTR Credit Requirements will allow for potentially more inadequate margin scenarios which may result in more uncovered losses to the *PJM markets as a whole* and to the PJM members, including those that do not actively participate in the FTR markets. The model-generated scenarios contemplate events captured in historical market data. Unfortunately, in the PJM markets that are inextricably tied to the physical power markets, the 3% tail which is uncovered may include an extreme weather event like a polar vortex or a Winter Storm Uri event which foreseeably could re-occur. Such extreme but foreseeable events can result in significant commodity derivatives market price swings, which may cause FTR market defaults, which may generate disproportionately large losses which PJM's members do not have the resources to bear. By missing 3% of

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[15] *Id.* at 20. OPSI notes that in stark contrast to PJM management's preference for a 99% CI, PJM's filed proposal is to *eventually* adopt a 99% CI. *See* December 21 Filing at 10, where PJM indicated it "advocated for [a] 99% [confidence interval]" to be a part of this proposal which seeks *immediate* approval by this Commission.
[16] *Id.* at 24.

> the outlying events of the past using a 97% CI when setting a protective Initial Margin level, the 97% CI choice knowingly exposes the FTR markets to foreseeable price moves that are not covered by the level of required Initial Margin. Even while the market proceeds without any defaults, the *PJM markets as a whole* and members of PJM (*including non-participants* in the FTR market) are effectively providing credit support to FTR market participants by *agreeing to backstop losses* resulting from a failure in FTR market margin policy.[17]

As articulated, default risk at a 97% CI can significantly impact PJM markets *as a whole* should the region experience a severe weather event. Even if extreme weather conditions do not materialize and defaults do not occur, ratepayers would *still* be indirectly underwriting the risk of FTR market participants with an Initial Margin at a 97% CI.

Even after characterizing the prospect for such catastrophic impacts and increased exposure to insufficient collateral,[18] Affiants Wolkoff and Anderson endeavor to mollify the concern with minimizing collateral requirements over an interim period by suggesting that otherwise "[s]ome participants could be forced to reduce their participation and/or liquidate some positions in PJM's FTR markets if the initial margin requirements exceed a market participiant's [*sic*] working capital available for margin purposes, and market disruptions could occur as a result."[19] The prospect of reduced participation would not be unexpected. As Affiants Wolkoff and Anderson point out, confidence intervals adopted by Derivatives Clearing Organizations ("DCOs") and Other Market Risk Managers (e.g. ERCOT, Nodal and ICE), where many of PJM FTR Market participants may also trade, are 99% or higher.[20] It is logical that PJM's Market Participants may gravitate to other markets if they can no longer offload their risk to non-participants and, indirectly, to ratepayers.

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[17] *Id.* at 22-23 (emphasis added).
[18] *Id.* at 22 ("we find the higher [99%] CI reduce[s] by 36% the incidence of scenarios with uncovered liquidation losses.").
[19] *Id.* at 28.
[20] *Id.* at 11.

II. CONCLUSION

OPSI appreciates PJM's efforts to remedy the risks inherent in its FTR market that led to the GreenHat default and its commitment to seek to improve upon such remedies. PJM's management, PJM's independent experts, the CFTC, and other major DCOs and Market Risk Managers all use or have advocated for the use of a 99% confidence interval for FTRs or similar financial products. However, the PJM Filing does not provide sufficient detail as to how PJM plans to move towards implementing this universally accepted standard, or how long it would take it to do so, in the interest of protecting its markets as a whole and shielding non-participants in its FTR markets – particularly ratepayers – from default risk. Until such information is provided in a manner that allows the Commission to confirm the proposed collateral requirement is indeed just and reasonable, OPSI recommends the Commission find the filing deficient.

Respectfully Submitted,

/s/ Gregory V. Carmean
Executive Director

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Dated: January 14, 2022

CERTIFICATE OF SERVICE

I hereby certify that the foregoing has been served in accordance with 18 C.F.R. Section 385.2010 upon each person designated on the official service list compiled by the Secretary in this proceeding.

/s/ Gregory V. Carmean
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Dated at Newark, Delaware this January 14, 2022

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UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)	Docket No.	ER22-703-000
	)		ER22-703-001
	)		

MOTION FOR LEAVE TO ANSWER AND ANSWER OF THE ORGANIZATION OF PJM STATES, INC. IN OPPOSITION TO THE PJM INTERCONNECTION, L.L.C. REQUEST FOR REHEARING

I. MOTION FOR LEAVE TO ANSWER

Pursuant to Rules 211, 212 and 213 of the Federal Energy Regulatory Commission's ("FERC" or "Commission") Rules of Practice and Procedure, 18 C.F.R. §§ 385.211, 212, 213, the Organization of PJM States, Inc. ("OPSI"),[1] respectfully submits this Motion for Leave to Answer and Answer in opposition to PJM Interconnection, L.L.C.'s ("PJM") Request for Rehearing filed on March 30, 2022 ("PJM Rehearing Request") in the above-captioned proceeding.[2] While the Commission's rules do not generally permit answers to requests for rehearing, the Commission allows such responses for good cause, including when an answer provides information that assists in the Commission's decision-making process or ensures a complete and accurate record in the proceeding.[3] With this brief answer, OPSI wishes to clarify the record and provide context that

[1] Unanimously approved by the OPSI Board of Directors on April 12, 2022.

[2] *Request of PJM Interconnection, L.L.C. for Rehearing*, ER22-703-002 and EL22-32-001, at 1–2 (March 30, 2022).

[3] *See Texas Eastern Transmission, LP and Algonquin Gas Transmission, LLC*, 141 FERC ¶ 61,043, at footnote 4 (2012) (admitting an answer to parties' rehearing requests since there will be no undue delay and may it provide information that assists in the Commission's decision making); *Tarpon Transmission Company*, 64 FERC ¶ 61,287, at 1 (1993) (finding good cause to accept an answer to a request for rehearing since it does not delay the proceeding and ensures a full and complete record); *Wrightsville Power Facility, L.L.C. v. Entergy Arkansas, Inc. Entergy Services, Inc. Entergy Arkansas, Inc. Entergy Gulf States, Inc.*, 102 FERC ¶ 61,212, at 4, 7 (2003) (finding good cause to accept an answer to a request for rehearing because it aids in the Commission's understanding and resolution of issues in the proceeding).

may assist the Commission in its decision-making process, thereby benefiting all parties.[4] Given the nature of these issues, OPSI's concerns are relevant to this proceeding.[5] This response also helps to clarify OPSI's position on these important issues.[6] Additionally, OPSI wishes to notify the Commission that PJM's Vice President and Chief Risk Officer, Nigeria Bloczynski, resigned from PJM on April 5, 2022.[7] In the PJM stakeholder process, the Chief Risk Officer recommended PJM adopt a 99% confidence interval for collateral requirements.[8] Therefore, good cause exists to grant this motion for leave to answer.[9]

II. BACKGROUND

PJM requests that the Commission grant rehearing of its February 28, 2022 order in this docket, which rejected PJM's December 21, 2021 (subsequently amended on December 30, 2021) filing ("PJM Filing") consisting of proposed revisions to its Open Access Transmission Tariff ("OATT") regarding the calculation of Financial Transmission Right ("FTR") Credit Requirement, and instituted a separate Federal Power Act ("FPA") Section 206 investigation in Docket No. EL22-32-000 ("Section 206 Proceeding"). PJM argues that the Commission's February 28, 2022 order "err[ed] by disregarding nearly all of the substantial evidence PJM presented in support of the December Section 205 Filing."[10] In the alternative, PJM requests that if rehearing is not granted the Commission clarify that its February 28, 2022 order "does not

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[4] *Independent Oil & Gas Association of West Virginia*, Docket No. RI74-188-003 (Dec. 21, 1983) (J. Nacy) (Unreported).
[5] *Buckeye Pipe Line Co., L.P.*, 45 FERC ¶ 61,046 (1988).
[6] *Natural Gas Pipeline Co. of America*, 52 FERC ¶ 61,219 (1990).
[7] *Bloczynski Resigns as PJM Chief Risk Officer*, RTO Insider (April 5, 2022), available at https://www.rtoinsider.com/articles/29899-bloczynski-resigns-pjm-chief-risk-officer.
[8] *See generally PJM Perspective on Main Motion and Initial Margin*, Presentation given at the October 14, 2021 PJM Special Risk Management Committee and October 20, 2021 PJM Members Committee meetings, Nigeria Bloczynski – Chief Risk Officer, available at: 20211020-item-01b-pjm-perspectives-on-main-motion-and-initial-margin.ashx.
[9] *Natural Gas Pipeline Co. of America*, 52 FERC ¶ 61,219 (1990).
[10] PJM Rehearing Request at 1.

foreclose any argument PJM may present in support of any or all of the rejected section 205 changes based on a new record in either the Section 206 Proceeding or a new FPA section 205 proceeding."[11] OPSI requests that the Commission reject PJM's Request for Rehearing.

III. ANSWER

PJM asserts that the Commission erred by not considering the bulk of the evidence it presented in the PJM Filing, which proposed using an historical simulation ("HSIM") model with the confidence interval ("CI") for initial margining in FTR markets set at 97%.[12] PJM claims that the Commission improperly narrowed its consideration to two issues, an independent auditor's evaluation of the HSIM model's technical capability which used a 99% CI, and the PJM Filing's estimation that an HSIM model using the 97% CI would collect less collateral than the currently effective rules, leading the Commission to find that PJM has not demonstrated that it will collect a sufficient level of collateral under the proposed Tariff revisions to avoid possible default among the riskiest participants in the FTR Market.[13]

OPSI agrees with the Commission that PJM has not shown that the HSIM model at a 97% CI would operate in the same manner as a 99% CI, the level at which the independent auditor validated the model. Though PJM insisted back-testing analyses included in the validation did show that a 97% CI would provide the expected failure rate of 3%, the entire validation model was run using a 99% CI as the basis for the analysis, leaving the record short of what PJM claims is sufficient evidence to use a 97% CI instead.[14] Furthermore, OPSI agrees with the Commission that PJM has not shown that the HSIM model at a 97% CI would collect enough collateral to

[11] *Id*. at 1–2.
[12] *Id*.
[13] *Id*.
[14] FERC February 28, 2022 order, ER22-703-001 and EL22-32-000, at 3–5.

sufficiently protect against default, despite PJM's parsing of the difference between portfolio risk and participant risk.[15].

In its February 28, 2022 order, the Commission notes that PJM's transmittal letter included an initial discussion titled "Limitations of the Current Approach,"[16] in which PJM acknowledged the extent to which its current Tariff provisions may have played a part in the GreenHat default and which led to PJM suggesting the current Tariff revisions to the FTR Credit provisions.[17] The Commission went on to reference PJM's transmittal letter emphasized its goal of implementing the specific recommendations from the GreenHat Report, but also stated its intent to "more broadly reflect[] a major step forward in advancing the overall recommendation to move the Tariff's FTR credit policy toward credit and collateral best practices in the energy commodity and financial derivatives industry …."[18] OPSI has previously stated that confidence intervals adopted by Derivatives Clearing Organizations ("DCOs") and other market risk managers (e.g. ERCOT, Nodal and ICE), where many of PJM FTR Market participants may also trade, are 99% or higher.[19] Though PJM's FTR market has been exempted from the provisions of the Commodity Exchange Act by the Commodity Futures Trading Commission ("CFTC"),[20] the best practices in the industry require a 99% confidence interval, including the CFTC's own minimum CI for swaps and the

[15] FERC February 28, 2022 order, ER22-703-001 and EL22-32-000, at 14–15; PJM Rehearing Request at 6–9.
[16] *Id*. at 3, 15–16; PJM Transmittal Letter, 2–5 (December 21, 2021).
[17] FERC February 28, 2022 order, ER22-703-001 and EL22-32-000, at 3, 15.
[18] FERC February 28, 2022 order at 3; PJM Transmittal Letter at 5.
[19] OPSI Comments, ER22-703-001 and ER22-703-000, unpaginated page 5 (citing to *Affidavit of Neal Wolkoff and Robert Anderson on Behalf of PJM Interconnection, L.L.C.*, December 21, 2021 at 11) (January 14, 2021); *see also, Impacts of Potential Financial Markets Reform Legislation on Organized Wholesale Electricity Markets*, Testimony of V.P. Duane, Vice President & General Counsel PJM Interconnection, L.L.C. before the United States Senate Committee on Energy Committee on Energy and Natural Resources, at 6 ("The FTR is a forward right or obligation with some attributes seen in swap contracts and other attributes seen in futures contracts.") (March 9, 2010); *see also, Margin Requirements for Uncleared Swaps for Swap Dealers and Major Swap Participants*, Final Rule, CFTC, 17 CFR Parts 23 and 140, Federal Register Vol. 81, No. 3 (January 6, 2016).
[20] *Final Order in Response to a Petition from Certain Independent System operators and Regional Transmission Organizations to Exempt Specified Transactions Authorized by a Tariff or Protocol Approved by the Federal Energy Regulatory Commission or Public Utility Commission of Texas from Certain Provisions of the Commodity Exchange Act Pursuant to Authority Provided in the Act*, CFTC, Federal Register Vol. 78, No. 63 (April 2, 2013).

policy framework developed by the Basel Committee on Banking Supervision and the Board of the International Organization of Securities Commissions.[21] By its own admission, PJM's filing seeks to more closely align its FTR credit policy with those best practices, and Affiants Wolkoff and Anderson confirmed that they recommended an interim 97% CI "with the clear understanding that PJM will implement a 99% Confidence Interval within a reasonable period of time."[22]

However, PJM made no effort to define the reasonable amount of time before it would implement a 99% CI, as OPSI recommended in its November 10, 2021 letter to the PJM Board, or further address the process or metrics by which it would evaluate or plan for this eventual transition. For these reasons, the Commission was correct both in finding that PJM's proposed FTR Credit Revisions are unsupported by the record in this proceeding and in instituting a 206 proceeding to investigate whether PJM's existing FTR Credit Requirements are just and reasonable. Affiants Wolkoff and Anderson explained that the risks of maintaining a 97% CI would include the potential higher likelihood for inadequate margin scenarios which could result in "more uncovered losses to the PJM markets as a whole and to the PJM members, including those that do not actively participate in the FTR markets …", especially following an extreme weather event.[23] The level of default risk being borne by the ratepayers, who effectively backstop the FTR markets, in maintaining a 97% CI, without any meaningful path to 99% CI being shown, is too great to be approved on this record.

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[21] *See* OPSI Comments, ER22-703-001 and ER22-703-000, unpaginated page 2 (this framework was created at the behest of the Group of Twenty in 2011 in order to set consistent global standards) (citing *Margin Requirements for Non-Centrally Cleared Derivatives*, BCBS and IOSCO (September 2013)).

[22] *Affidavit of Neal Wolkoff and Robert Anderson on Behalf of PJM Interconnection, L.L.C.*, December 21, 2021 at 29.

[23] OPSI Comments, ER22-703-001 and ER22-703-000, unpaginated pages 4–5 (citing to *Affidavit of Neal Wolkoff and Robert Anderson on Behalf of PJM Interconnection, L.L.C.*, December 21, 2021, at 11) (January 14, 2021).

IV. CONCLUSION

OPSI continues to maintain that a 99% CI for FTRs is appropriate and necessary as the prevailing industry standard and should be adopted by PJM. The 99% CI was supported by PJM management, the independent experts hired by PJM, as well as the CFTC, DCOs, and other market risk managers. PJM did not present adequate evidence to support its continued insistence on a 97% CI, and the Commission was correct to reject the December filing and open a Section 206 investigation into the justness and reasonableness of PJM's current FTR Credit Requirement. As such, OPSI asks that the Commission reject PJM's request for rehearing.

Respectfully Submitted,

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Dated: April 12, 2022

CERTIFICATE OF SERVICE

I hereby certify that the foregoing has been served in accordance with 18 C.F.R. Section 385.2010 upon each person designated on the official service list compiled by the Secretary in this proceeding.

/s/ Gregory V. Carmean
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Dated at Newark, Delaware this April 12, 2022.

Document Content(s)

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Attachment D

Affidavit of Neal Wolkoff and Robert Anderson
on Behalf of PJM Interconnection, L.L.C.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

	)	
PJM Interconnection, L.L.C.	)	**Docket No. ER22-___-000**
	)	

AFFIDAVIT OF
NEAL WOLKOFF AND ROBERT ANDERSON
ON BEHALF OF PJM INTERCONNECTION, L.L.C.

December 21, 2021

I. INTRODUCTION AND BACKGROUND

PJM is voluntarily implementing certain enhancements to its credit risk management policies, and in particular to its method of establishing margin requirements for participants in its Financial Transmission Rights ("FTR") markets. These enhancements are part of an ongoing effort to ensure that PJM's risk management practices are positioned appropriately relative to best practices in the energy commodity and financial derivatives industry. The FTR transactions that take place in PJM markets are unique products, and are exempt from the jurisdiction of the Commodity Futures Trading Commission ("CFTC"). Nonetheless, PJM sees great value in continually improving and enhancing its risk management policies using as a guide derivatives industry practices as they evolve over time. Effective risk management practices increase market confidence in the financial stability of the PJM markets by reducing the likelihood that its members will be exposed to unforeseen financial risks.

Since the GreenHat default, PJM has implemented a number of changes to its credit requirements for market participants in the FTR markets (the "FTR Credit Requirements") to better manage and mitigate the potential risks that the FTR markets, and the activities of participants in the FTR markets, may pose to the PJM community. PJM's role as a risk manager is to protect the PJM markets as a whole, on behalf of the PJM members that may otherwise bear the cost (market losses) associated with other market participants' activities, particularly defaults that may result in market losses that are in excess of the aggregate collateral collected and held by PJM for that defaulting party.

Credit risk management policies and procedures that rely on financial models to determine the margin amount to be posted and maintained from time to time by market participants commensurate with the risks of each type of product and market participant portfolio are a current practice found in the commodity and financial derivatives markets. An example is found in the CFTC regulations for "Derivatives Clearing Organizations (DCOs)," also known as central clearing counterparties or "CCPs". Although the CFTC has not determined that PJM (or any other RTO or ISO) is a DCO, the CFTC used its Core Principles for DCOs in its analysis of the RTOs and their markets, and in its Order exempting RTO transactions from CFTC jurisdiction commented favorably in its analysis on the similarities between the Core Principles for DCOs and the RTOs' risk management policies developed under FERC Order 741 and FERC Rule 35.47.

PJM's Initial Margin methodology proposal uses a historical simulation model to determine an Initial Margin requirement. The model generates Initial Margin requirements sufficient to cover potential losses from a default in a market participant's transaction portfolio, using historically-based price data and based on market price movements over the expected time period during which a defaulting market participant's portfolio could be liquidated in an orderly fashion. The model then applies a chosen Confidence Interval to determine a potential loss value for the portfolio. As FTR auction prices and portfolio positions change with time, the model re-establishes the Initial Margin requirement based on new information, providing for periodic adjustments to the posted

margin requirements. This methodology is consistent with the broad principles outlined in the CFTC's Core Principles for DCOs. As set out below, DCOs are required to calculate Initial Margin commensurate with the risks of each product and portfolio using a financial model, and at a level that meets a 99% Confidence Interval. PJM has recently obtained a vote of its members in favor of implementing a historical simulation (HSIM) model, using a 97% Confidence Interval, as the basis for generating Initial Margin requirements under its FTR Credit Requirement.

Below is further explanation of the PJM Initial Margin model, how it will be used, and more about the rationale for PJM implementing margining practices for market participants in its FTR markets similar to those used by DCOs in CFTC-regulated markets in keeping with its role as market risk manager for the PJM markets as a whole.

II. QUALIFICATIONS

Q1. Please state your names, titles, and business addresses.

Robert Anderson
Executive Director, Committee of Chief Risk Officers
8000 Research Forest Dr, STE 115-278
The Woodlands, TX. 77382

Neal L. Wolkoff
CEO, Wolkoff Consulting Services, LLC
717 Powderhorn Rd.
Manchester Center, VT 05255

Q2. Please briefly describe the services provided by you.

A. At PJM's request, we are providing an independent expert assessment of proposed risk management enhancements to PJM's FTR Credit Requirements. Our explanations and opinions specifically cover:

- Review relevant standards and requirements regarding swaps and derivatives margining and clearing whether for listed futures and options or Over-the-Counter ("OTC") derivatives; examine the role of the CFTC and FERC in establishing relevant standards for which risk management of FTRs should be governed; and examine the market management goals of a robust margining system.

- Evaluate whether a particular Confidence Interval of between 95% and 99% is recommended and may be more appropriate than the other choices given (1) the regulatory framework relating to PJM; (2) the industry best

practices in related financial markets for commodity derivatives; (3) the unique characteristics of Financial Transmission Rights; and (3) the objectives and structure of PJM;

- Prepare expert testimony in a regulatory proceeding before FERC.

Q3. Mr. Anderson, please briefly describe your qualifications.

A. I have over thirty years of experience in the risk management profession as both a practitioner and as a professional advisor. For over a decade I have been CEO of the Committee of Chief Risk Officers, the energy industry's premier organization dedicated to advancement of best practices in risk management across all energy industry segments. In this role, I've gained personal knowledge of the internal practices at dozens of energy companies and have developed a deep knowledge of the modeling approaches, market structures and conditions, and trading practices that underpin effective risk management. As the head of business development for an international derivatives trading shop, and as the Chief Risk Officer for one of the largest trading entities in energy commodity markets, I have designed risk management strategies and provided risk oversight of industry-leading trading activities in the oil, natural gas, and power markets. As a consultant with the top-ranking firm for management consulting, I have provided strategic advice for some of the largest and most complex commodity trading teams in industry. Finally, as an expert witness for regulatory proceedings and corporate litigation cases involving mis-steps in the management of a commodity trading business, I bring knowledge of the consequences of poor choices in the application of risk management practices.

My BIO is included in Attachment F.

Q4. Mr. Wolkoff, please briefly describe your qualifications.

A. I have had a lengthy career as an attorney and C-level executive at derivatives and securities exchanges, and as a lawyer and independent consultant working in the area of derivatives operations and regulations. I started my career as an Honors Program Trial Attorney with the CFTC, Division of Enforcement. Thereafter, from 1981 until 2003, I held several legal and managerial roles at the New York Mercantile Exchange ("NYMEX"), which included being the senior regulatory officer as a VP and Senior VP, the Executive Vice President and Chief Operating Officer, and the Acting President for a period of one year. I had extensive responsibilities and experience with the risk management policies and practices at NYMEX, including the setting of Initial Margin, the daily and intra-day settlement and variation margin system, and the circumstances under which initial margin levels were changed. I was also the Chairman and CEO of the American Stock

Exchange until its acquisition by the New York Stock Exchange, and was the CEO of ELX Futures, L.P. which was a futures exchange formed by a consortium of large banks to compete in the U.S. Treasury futures space.

My BIO is included in Attachment E.

Q5. Describe your previous experience with PJM as it relates to the GreenHat, Inc. matter.

A. The two of us conducted an independent review of events surrounding the GreenHat default in the PJM FTR market. We submitted our report to the PJM Board, which in turn released it to the public, on March 26, 2019. Our report recommended a number of changes to the PJM risk management practices, particularly addressing oversight of the FTR markets. Several of our recommendations concerned the credit risk management policies (including Initial and Mark to Auction measurement of risk) in the PJM FTR market. Much of what is discussed in this affidavit is a continuation of efforts by PJM to improve its risk management policies in order to implement appropriate practices for this vitally important market, while at the same time strengthening risk management for the benefit of PJM members, who depend on PJM to run financially stable markets protecting the members, customers, and consumers - including ratepayers - from disruption or unexpected financial losses.

Q6. What is the purpose of your affidavit?

Our affidavit presents the results of our review of PJM's proposed enhancements to its method of determining a market participant's collateral requirement, which PJM refers to as the FTR Credit Requirement. Our affidavit supports changing PJM's model for calculating the FTR Credit Requirement from its existing model to an industry standard Initial Margin methodology utilizing a historical simulation model.

Q7. Why did PJM request you to review the new FTR Credit Requirement methodology?

PJM selected us to review the proposed FTR Credit Requirement enhancements to its credit policy because we have extensive experience and expertise with commodity derivatives markets and risk management policies. In addition, given our work in reviewing the GreenHat matter, we have developed a familiarity with the PJM FTR markets (all RTO and ISO markets operate on a somewhat different set of risk management policies) that would allow us to proceed in this review in an efficient and knowledgeable manner.

Q8. How do PJM's proposed Credit Requirements fit within PJM's core business?

PJM is a RTO that coordinates the operation of the electricity transmission system in the Mid-Atlantic U.S. and portions of the Mid-Western U.S. (in all or parts of 13 states and the District of Columbia). PJM employs a staff with specific engineering and technical expertise and other relevant skills necessary to administer wholesale electricity markets, oversee electric generator dispatch and transmission system operations, and ensure overall system reliability.

PJM is in the business of providing a reliable and uninterrupted flow of power across the interconnected electric grid in order to deliver power to end-use customers. Collateralizing a financial commodity market, is extremely important for any ISO/RTO in determining fair and reasonable prices, yet not at the core of expertise of an ISO/RTO. In contrast, the models supporting an effective set of policies to appropriately collateralize financial commodity derivatives positions are the core business of central counterparties (CCPs) in the cleared derivatives space for both listed futures contracts and options on futures, and for unlisted financial commodity derivatives. Thus it is important for the ISO/RTO to look to the practices of DCOs in the area of methodologies for collateralizing financial markets.

The CFTC and several independent financial derivatives industry organizations, specifically ISDA, IOSCO and BIS, have a particular focus on standards setting and developing and promoting best practices in risk management for financial derivatives. PJM has greatly improved its internal skills set for managing market risk, in keeping with its expert team to manage electric transmission systems risk. Nonetheless, PJM reached out to us for an unbiased, expert view of whether its proposed market risk management policies would be reasonable and appropriate for its FTR marketplace.

As the independent consultants who reviewed the circumstances surrounding the GreenHat default, we reviewed PJM's risk management policies and procedures at that time for determining appropriate collateral for FTR transactions, and found that the procedures were lacking in targeted and reasonable protections for the marketplace as a whole. One of the recommendations we made in the report as a result of our review was to significantly improve the collateral/ margin policies.[1]

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[1] Anderson, Wolkoff, and Helfer, Report of the Independent Consultants on the Green Hat Default (Mar. 26, 2019) ("*Greenhat Report*"), available at https://www.pjm.com/-/media/library/reports-notices/special-reports/2019/report-of-the-independent-consultants-on-the-greenhat-default.ashx?la=en.

"A1) Use the mark to auction values established in the more frequent auctions (see recommendation F) as the basis for 'variation margin,' charging as a current debt the value erosion between the purchase price and the current market value as determined by the latest auction.

A1.1) This will help to capture the credit risk for all FTRs, not just near term FTRs, and reduce the current volatility of margining due to infrequent auctions.

A2) Retain the current 10¢/MWh minimum charge, in addition to purchase price, as a form of 'original margin'15 until such time as more precise measurements become available to determine original margin.

PJM has now developed and is prepared to implement a significant revision to its credit policy for FTRs, and has asked us to examine the proposed new policy, and determine whether it is an appropriate and effective policy to protect the marketplace as a whole from the risk of default by market participants buying, selling and holding FTRs.

PJM's revised credit policy relies heavily on the methodology used to manage the risk of listed financial commodity derivatives as well as OTC derivatives (swaps), while at the same time making allowances for characteristics of those derivatives products and markets that are not well aligned with the characteristics of FTR contracts and the PJM markets.

Q9. Please explain the similarities between FTRs and commodity derivatives or "swaps."

First, we might ask why the financial commodity derivatives world is the most appropriate risk management benchmark for managing the risks associated with FTR contracts given that such markets are not a perfect match with all the features of the FTR markets.

We believe that PJM is making an appropriate choice in looking toward the risk management (margin) policies of the financial commodity derivatives markets to shape its risk management policies, due to the material parallels between such markets and the FTR markets. FTR contracts and FTR markets, in our view, have many of the same market risks associated with them as regulated financial commodity derivatives, which are discussed in further detail in this paper. These similarities are an important reason why we rely on the risk management practices and policies governing the commodity derivative world.

Standardized financial commodity contracts are either commodity futures contracts, transacted on a regulated futures exchange, such as the CME, or transactions entered into over-the-counter between two contract counterparties as "swaps." A primary attribute of a financial derivative is that its price depends on events, or derives from events that happen outside the four corners of the instrument. Similarly, an FTR is based on events that occur in the physical power markets, as illustrated below. Furthermore, one key purpose of any financial commodity derivative is to allow commercial companies that use commodities in the normal course of their business operations to "hedge," or to shift, their commodity price risk to someone else who is willing to accept it. An FTR serves that purpose, also as illustrated below.

The holder of an FTR is not buying or selling electric energy, or any other physical commodity, when it buys, sells or holds an FTR. Instead, if you are an electric utility, you as a buyer of physical power are replacing a floating price risk component of the physical power (line congestion) purchase, over which you have no control, with a fixed payment component (congestion fees) that provides an offset. The cost of replacing floating price risk with fixed price certainty or vice versa is determined at competitive auctions which are managed by PJM as a market administrator. PJM, through PJM Settlement, acts as the central counterparty to every FTR transaction, whether with a buyer or a seller.

FTR contracts are standardized contracts - although having thousands of possible locational pricing differences. The final value of an FTR at settlement is a price consisting of the aggregate of price differentials along a particular transmission route in the Day Ahead Market. The difference in price between a source point where the power is generated, and a sink point where the power is delivered, is deemed to be a product of line congestion which is in addition to the cost of the delivered physical power. Load Serving Entities that provide power delivered to a certain node for their customers use FTR contracts as a means to hedge against the unknown and variable, or "floating," cost of transmission (for which they have no control) along the path or paths on which they rely for delivering their power.

Financial market participants, sometimes called "speculators," also participate in the FTR market in the hope of taking on price risk (the reverse of hedging) to realize a trading profit. Speculators provide liquidity for market participants, including commercial risk hedgers, allowing such hedgers to enter and exit the market (selling their floating commodity price risk) without suffering price slippage caused by wide bid-ask spreads due to few participants executing infrequent transactions. The purpose of this affidavit is not to advocate for any particular type of FTR market participant, but simply to set out the risk management parameters of all entities using the market and the financial risks attendant to such market participants transacting in FTRs.

III. THE PURPOSE OF INITIAL MARGIN

When the FTR is purchased, there can be from one month up to 36 months until the final cash flow of the FTR is determined -- depending on the tenor of the transaction. PJM has required that the holder of an FTR contract meet certain credit requirements based on several factors, but it has not historically used an Initial Margin calculation based on a historical simulation model.[2]

What an FTR along any given path is worth is a determination made by regular auctions administered by PJM, with members participating in a competition to obtain transmission line congestion rights at a fair market price. To protect the marketplace as a whole against the risk of loss if one market participant purchases FTRs, but then defaults, PJM determines the appropriate level of collateral to be paid, or "margin" that must be "posted to PJM" by an FTR purchaser before the FTR position is assigned to that purchaser.

As was the case with GreenHat, in the event an FTR market participant defaults, and the collateral or margin posted to PJM is not sufficient to cover the losses associated with liquidation of such market participant's defaulted positions, the uncovered loss is socialized across the wider PJM membership whether or not the PJM members participated in the FTR auction or the FTR markets. Certain members of PJM are regulated entities serving end-use electric customers, and when

[2] PJM's current credit policy for the FTR market is set forth in a publication by PJM Settlement, *see Credit Overview and Supplement to the PJM Credit Risk Management Policy Version 3.5*, PJM Settlement at PP. 30-33 (June 23, 2021) https://www.pjm.com/-/media/documents/agreements/pjm-credit-overview.ashx (last visited Dec. 9, 2021).

market losses are allocated to one of those entities, PJM is concerned that the loss may ultimately be borne by its end-use business and residential customers. An FTR market participant's default not only results in financial losses to the members, but it can also impact end-use customers and cause a loss of confidence in the PJM markets as a whole.

FTR transactions are deemed to be essential to the proper functioning of PJM's power markets, offering benefits to all because of the ability of commercial risk "hedgers" to mitigate their risks by engaging in FTR auctions and FTR market transactions. A disturbance to market confidence can undermine the well-being of the market by reducing liquidity, resulting in higher volatility and higher prices.

IV. IMPORTANT DIFFERENCES FROM COMMODITY FUTURES MARKETS

A risk management system that is continuously improving is advisable inasmuch as, while FTRs resemble certain other financial commodity derivatives products, such as listed commodity futures contracts and swaps, the FTR markets differ from other financial commodity derivatives markets in several noteworthy ways: lack of frequent pricing data in the FTR markets, and the lack of intermediation - the functions of which fall largely on PJM. These differences influence the design of the historical simulation model intended to be used for PJM's FTR markets.

While margin posted for listed commodity futures contracts is required by the CFTC to cover the risk of price moves over a minimum of one day at a 99% level of certainty (the "Confidence Interval"), listed commodity futures and options markets are continuous auction markets with an end of day settlement price. (*See* 17 C.F.R. §39.13 (g)(2)(A). There are many opportunities each trading day for a Derivatives Clearing Organization to mark every open position to market and collect margin on the price movements since the last calculation of margin based on a prior price reference point. Most OTC swaps, particularly standardized swaps, have price references that are frequently accessible, if only once a day or every few days. The CFTC mandates that DCOs calculate Initial Margin for swaps at a 99% Confidence Interval for minimum periods, respectively, of one, five and ten days coverage depending on the underlying asset class and whether the swap is cleared or not. *See* 17 C.F.R. §39.13 (e)(2)(B) & (C); for uncleared swaps: 17 C.F.R. §23.154(a)(2)(i).

In contrast, FTRs are priced at the time of auction. Auctions occur at their greatest frequency monthly. They also occur quarterly during the planning year, and annually. As such, swap regulations about margin coverage become difficult to apply because the coverage period would be far in excess of one, five or ten days, and at a Confidence Interval of 99% the relative margin that would be required is quite a bit higher than it would be if the FTR priced daily or even weekly. Still, we do not believe that the organization and administration of the market should deter the market manager, PJM, in the long run from assessing the risk as it exists in the only measurements possible given the nature of pricing and repricing of FTRs in its market.

Q10. Describe a Derivatives Clearing Organization.

A. DCO is an entity registered with the CFTC that provides "clearing services" for exchange-listed commodity futures and options contracts, as well as for most standardized financial swaps. Clearing services in the financial markets, in brief, result in the novation of every contract sought to be cleared so that the DCO, rather than the original buyer and seller of the transaction, is the central credit counterparty, ***i.e.*** the buyer to every seller and the seller to every buyer. As a result of the novation, the buyer and seller are no longer concerned about the credit risk of each other inasmuch as the counterparty-to-counterparty credit risk becomes a risk of non-performance by the DCO, something that is highly remote. In addition to a series of protective rules and procedures, a DCO has available to it a series of backstop funding sources should the clearinghouse not be able to perform on each and every contract that it has cleared.

To provide market participants with the level of confidence to engage in the trading activity that a marketplace needs in order to have liquidity, counterparty credit risk must be removed or at least significantly mitigated. To protect the financial market system from a clearing member defaulting on its financial obligations to the DCO, each DCO is required to collect Initial Margin (sometimes called "Performance Bond") from its clearing members on every contract submitted for clearing, and that was not offset on the same day it was initiated. In turn, DCOs also require their clearing members to collect from the members' customers the required amount of Initial Margin. The CFTC prohibits members of a DCO from unsecured financing or lending money to a customer to pay for margin so that a clearing member's capital is not impaired by the activity of any customer.[3] If a customer defaults to the clearing member, only then must the clearing member finance the shortfall and liquidate any outstanding positions belonging to the defaulting customer.

When a market price of a commodity futures contract moves, the DCO collects, and requires its clearing members to collect, margin from the longs if the market price of the futures contract fell, or from the shorts if the market price went up. The amount of margin to be collected on an ongoing basis is based on a comparison of the current price to the price the previous time margin was calculated and collected. This process of re-valuing open positions at set times when new price information becomes available is called a "Mark to Market" process. Open positions can be Marked to Market several times a day for exchange traded commodity futures contracts, or once at the end of each day for most standardized OTC centrally cleared swaps.

A regulated DCO is required to apply at least a 99% CI to contracts that it clears, whether the contract is exchange traded or OTC. DCOs are required to use models to set their initial margin levels, and set a statistically derived Confidence Interval of 99% or better for the period it would take to have an orderly liquidation of cleared, or most uncleared, derivatives positions. *See* 17

[3] *See* 17 C.F.R. §1.30, "A futures commission merchant may not loan funds on an unsecured basis to finance customers' trading, nor may a futures commission merchant loan funds to customers secured by the customer accounts of such customers."

C.F.R. §39.13 (g)(2)(iii) for listed contracts, which must be cleared, and for cleared swaps, and for uncleared swaps: 17 C.F.R. §23.154(a)(2)(i).

The minimum liquidation period that Initial Margin must cover is one day for listed contracts and most cleared swaps (while some less liquid cleared swaps must have a coverage period of not less than five days. *See* 17 C.F.R. §39.13 (g)(2)(ii). Major DCOs impose a 99% CI or greater for Initial Margin to cover a "Margin Period of Risk" of at least one day, but set at a level deemed appropriate for a particular product. *See* e.g. the policy followed by the CME Group, Inc. *Stability in Times of Stress: CME Clearing's Anti-Procyclical Margining Regime*, CME Group, at 9 (May 2021), https://www.cmegroup.com/clearing/files/stability-in-times-of-stress-cme-clearings-anti-procyclical-margining-regime.pdf.

The higher the CI the market is required to achieve, the larger the amount of funds the model will calculate and the market participants will be required to post for Initial Margin. Similarly, the longer the duration of the expected Margin Period of Risk, during which Initial Margin is expected to provide coverage of any market price change as a defaulted market participant's portfolio is liquidated, the larger the amount of required funds the model will calculate, and the market participants will be required to post, for Initial Margin. A combination of a high CI and long duration Margin Period of Risk will result in Initial Margin levels that can be considerably higher than if the DCO were protecting against price moves that might occur during a shorter Margin Period of Risk or with a lesser or lower CI percentage.

Figure 1. Confidence Intervals used by Derivatives Clearing Organizations and Other Market Risk Managers

Organization	Confidence Interval (%)	Link
Nodal	99.7	https://www.nodalclear.com/services/risk-management/margin-methodology
ICE	99	https://www.theice.com/clear-europe/risk-management
CFTC	99	https://www.ecfr.gov/current/title-17/chapter-I/part-39#p-39.13(g)
BCBS&IOSCO	99	https://www.bis.org.bcbs/publ/d475.pdf
ERCOT	99	http://www.ercot.com/mktinfo/crr

Q11. Please describe the governance of the market risk management practices of a DCO and PJM.

The CFTC's Core Principles do not apply to PJM, which is not subject to the jurisdiction of the CFTC. In the RTO Exemption Order, pursuant to which the CFTC exempted PJM and other RTOs/ISOs and transactions in their markets, including FTRs, from the jurisdiction of the CFTC, the CFTC found that FERC Rule 35.47 requires risk management practices that are similar in many respects to the CFTC Core Principles for DCOs while recognizing that, for PJM and other RTOs,

compliance with FERC Rule 35.47 achieves risk management goals that are congruent with compliance with CFTC Core Principles for DCOs.[4]

V. PJM has complied with FERC Rule 35.47, but nonetheless such compliance did not avoid the Tower/Power Edge default in 2008 or the GreenHat default in 2018, which resulted in losses that were socialized to PJM members. Explain PJM's philosophy to look to derivatives market risk management practices.

PJM's current efforts to enhance its risk management practices to align more closely with the standards of the CFTC's Core Principle D for DCOs is a voluntary effort, not one that is mandated by regulation. PJM, as the market risk manager for all the PJM markets, with its concerns about protecting the PJM members from losses attributable to any FTR market participant default, continues to strive to avoid any such defaults in the future. PJM is proposing a stepped approach to implement its risk management enhancements for managing credit risk in the FTR market by beginning to apply margin procedures modeled on what the CFTC imposes on DCOs that clear financial commodity derivatives, including swaps.

PJM already performs several of the core functions of a DCO although it is not subject to the CFTC regulations that govern DCOs. PJM, in a manner similar to a DCO, is the buyer to every seller and the seller to every buyer in transactions on its markets, and thus the parties to a transaction always avoid the direct credit risk of having another individual market participant as the FTR contract counterparty. Instead, PJM Settlement, a wholly owned subsidiary of PJM, takes the opposite side of each transaction with a buyer or a seller, greatly mitigating if not eliminating the credit risk a market participant might otherwise experience of doing business with a single counterparty. PJM Settlement is backed financially by the members of PJM, each of whom have agreed pursuant to their membership agreement with PJM to accept a share of any market obligations or losses resulting from a member default.

Like a DCO, PJM determines the risk of adverse price moves from congestion for each available set of data points on the grid. Unlike a DCO, which accepts all trades in derivatives contracts that it has agreed to clear (futures contracts, options on futures contract or swaps submitted for clearing) and then collects Initial Margin, PJM requires the posting of margin with PJM Settlement before a member is allowed to participate in an FTR auction, and have an FTR transaction accepted by PJM.

Unlike a DCO, PJM is not an intermediated market. PJM Settlement accepts trades from principals, and there is not an intermediate level of a clearing member sitting between a DCO and its customer as exists in the listed futures and cleared swaps markets. DCOs have a clearing member to buffer the consequences which may arise from a clearing member's customer default. In fact, a customer may default, but its clearing member is responsible to satisfy the amount due to the DCO - even to the point of bankruptcy - before any obligations are absorbed by the DCO and the market losses

[4] *See* the RTO Exemption Order at 19884.

assigned to other members of the DCO. Clearing members of a DCO are incented to manage risk by the fear of clearing a customer that may not meet its financial obligations in order to preserve their commercial success, if not their commercial existence. The absence of this extra layer of market intermediation places a burden on PJM to treat membership admission to PJM as a clearing member would treat accepting a client ("Know Your Customer"). *The absence of such market intermediation places a unique burden on PJM that DCOs do not face.* This situation is why our GreenHat report recommendations addressed numerous risk management practices beyond collateral management.[5]

Q12. What are the origins of the CFTC's margin requirements for swaps?

For listed commodity futures contracts and options on futures contracts, which are traded at commodity exchanges and cleared by DCOs, the DCOs have long (more than 30 years) used models to calculate margin requirements, with a standard Confidence Interval of 99% and with a holding or coverage period of one to two days. The models that DCOs initially developed were Historical Simulation Models, like the one that PJM is implementing for its FTR markets. DCOs have found that models based on data about how the markets have reacted to events in the past can be a reliable predictor of future events, at least within the range of possibilities of events that have happened in the past.

With the advent of listed options on futures contracts in the early 1980s, the DCOs changed the model for margin calculations for those products having a corresponding options contract from a Historical Simulation Model to a Volatility Model. DCOs found that the options trading market can be an even better predictor of future events than HSIM models, and consequently models that rely on forward-looking options trades were extremely accurate predictors of future price moves. The past is not as good a predictor of the future, and historical simulations anticipate possible repetition of past events, but new market conditions are not predicted as well as with a volatility model. DCOs clear a number of futures contracts without corresponding options contracts (e.g. Palladium Futures and Propane Futures), and for those products, DCOs use a Historical Simulation model.[6]

Following the financial crisis of 2008-2009, two important international regulators - IOSCO and BIS - recommended that financial commodity swaps, like exchange-listed futures contracts and options on such futures contracts, should be subject to a margin model similar to the listed world with a Confidence Interval of at least 99% and a coverage period determined by the estimated liquidation period required for a particular product. *See Capital requirements for bank exposures to central counterparties*, Basel Committeee on Banking supervision (April 2014), https://www.bis.org/publ/bcbs282.pdf (last visited Dec. 9, 2021); and *Margin requirements for non-centrally cleared derivatives*, Basel Committee on Banking Supervision and Board of the

[5] *See* Q13 of this paper.

[6] Nodal and ICE Clear are either utilizing or in the process of transitioning to HSIM VaR based models to calculate initial margin for electricity-related futures contracts and swaps. *See* Bloczynski Affidavit at 10.

International Organization of Securities Commissions (Feb. 2013), https://www.iosco.org/library/pubdocs/pdf/IOSCOPD403.pdf.

To the extent swaps were one of the causes of the financial crisis, international oversight organizations and regulators wanted to apply industry standard best practices to what had been a largely unregulated market governed solely by agreements entered into between two private counterparties to a trade. In November, 2011 the CFTC adopted rules governing required margin practices by DCOs for cleared swaps, *see* 17 C.F.R. § 39.13; and in January 2016 margin rules for swap dealers and major swap participants entering into uncleared swaps, *see*, 17 C.F.R. § 23.154. The CFTC's Regulations set forth requirements similar to those proposed at the time by BIS and IOSCO (approved as final standards after the CFTC adopted its regulations). Margin for swaps was to be model-based, have a Confidence Interval of 99%, and a liquidiation period/coverage period of one, two, five and ten days depending on the swap asset class and whether cleared or uncleared.

VI. THE STRENGTHS AND WEAKNESSES

It is our view that, while there are some weaknesses in PJM's proposed initial implementation of a historical simulation model methodology to enhance its FTR Credit Requirement, the strengths materially outweigh the weaknesses. Indeed, the currently proposed HSIM model is a significant step forward in risk management practices.

On the side of weaknesses,

1) The historical simulation model approach does assume that history will repeat itself, from a risk perspective. Of course, this is not always true in energy markets. In particular in the FTR markets, we can certainly assume with confidence that events may occur in the future which have yet to be seen.

2) In the case of FTRs we know the PJM markets are intrinsically linked to the physical market flow of electric energy on the transmission grid. Asset resources available at nodes and the transmission resources available between nodes can change unexpectedly or "by design," as constraints are eased with infrastructure upgrades. As a consequence of design changes, it is intuitive that, for those affected FTR paths, older market data may be less representative of price behaviors in the future. However, PJM has provided information showing that the number of such major infrastructure upgrades is quite limited from year-to-year. Furthermore, because IM calculation, and changes thereto, reflect the net effect of all historical changes to a market participant's portfolio's value, it is not clear without further study, whether or not infrastructure changes at specific physical locations will have a material impact on a market participant's overall portfolio IM calculations.

3) The PJM FTR data set is a rich historical database, yet it is still not statistically ideal in terms of input for the model. First, some proxy prices are used in a backfilling process if a node or a path does not have the entire history of auction prices since 2008. Second, the statistical properties of the data set for an FTR portfolio must be adjusted for small sample size, and in order to make that adjustment, data are assumed to be normally distributed. This data blending and extrapolation risks introducing an error component into the model's output. KPMG's model validation study[7] has determined through backtesting that the error component is small and controlled. It is recommended that, once sufficient data is developed and input into the model over time, the statistical assumptions should be dropped, and the confidence interval instead measured directly from the distribution derived from actual historical data.

On the side of strengths,

1) Analyzing and applying historical data to current portfolios is a particularly effective approach to gain insights into how FTR markets have reacted to the complex and inter-related driving factors that come to bear on prices. The ability to capture these complex factors and their net effect on auction prices is a valuable aspect of the historical simulation approach.

2) During their relatively short history, PJM's FTR markets have seen a number of events that were, at the time, unexpected. For example, the impact of extreme winter storm events,[8] the COVID-19 pandemic, and cyber-attack crises[9] provide colorful examples of how often the unexpected seems to happen in our country's regional energy markets. Therefore, for a portfolio of FTR transactions, the market price impact of unexpected market stress events of the past may well be captured in the associated historical data. The impact of recent winter storm events[10] and cyber-attack crises provide colorful examples of how readily the unexpected happens in our country's regional energy markets.

These strengths mitigate to some degree the weakness mentioned in 1) above.

3) There is a great deal of energy industry experience with historical simulation modelling, which provides a rich set of technical resources to draw from. These resources support best practices for backtesting and approaches to incremental improvements in a model's ability over time to more accurately forecast the risks of FTR portfolios.

4) Most importantly, the historical modeling approach provides explainable, verifiable results. These results can be readily supported and understood as a fair, just, consistent and reasonable basis for Initial Margin calculation. By contrast, the more formulaic methods used at PJM in the past have been shown to have critical flaws. Further, other well-known modeling methods, such

[7] Model Validation Report, KPMG, January 21, 2021.

[8] The Polar Vortex events in January 2014 and December 2016, and winter storm Uri in February of 2021.

[9] The cyber attack on Colonial Pipeline in May of 2021.

[10] The Polar Vortex events in January 2014 and December 2016 winter storm Uri in February of 2021, and cyber attack on Colonial Pipeline in May of 2021, just to name a few.

as the parametric or the Monte Carlo approaches, require underlying assumptions which can be challenging to explain or to build consensus for.

Q13: Please explain the fit between this change proposal and your recommendations from the GreenHat report.

In our March 2019 "Report of the Independent Consultants on the GreenHat Default", commissioned by the PJM Board, we studied the situation that PJM faced surrounding the costly default of one of the largest participants in the FTR markets. Based on our findings, we made thirty-six challenging recommendations for PJM to pursue as it strived to advance their overall risk management practices.

As of the time of this writing, PJM has addressed all of the recommendations, and successfully implemented some 90% of them. The Initial Margin topic of this affidavit was included as just one of our recommendations, reflecting another important consideration worth considering herein.

Though a major step forward for margining practices, the HSIM model implementation that we are advocating here is certainly not an end-all for risk management practice advancement at PJM. We believe it is important to consider the HSIM model implementation as part of a wider process of risk management practice developments at PJM. We recognize the important advancements that PJM's risk function, established after our report, has made in other risk management subject areas. These broad subject areas where we made specific recommendations include:

A) Advance Credit/Collateral Best Practices into the Tariff
   a. (HSIM model implementation fits here)

B) Clarify the Role of PJM as Manager of Risk in its Financial Markets

C) Build a Customer Awareness Beyond Market Procedures & Rules

D) Implement Technical Practices for Participant Risk Management

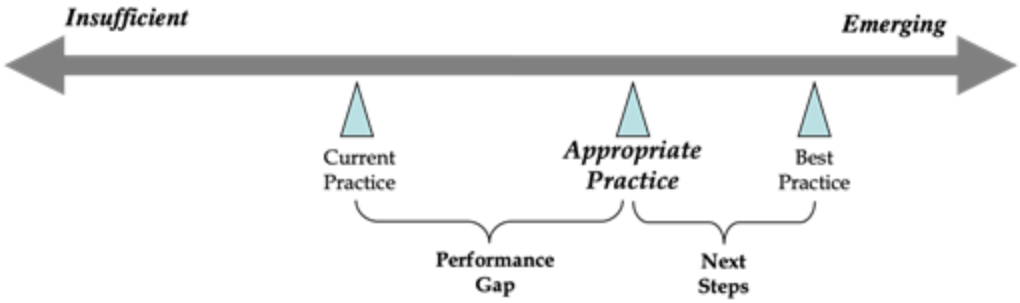
E) Bring On-board and Develop New Expertise in Risk Management

As mentioned, all of these areas have been addressed by PJM in some form since our 2019 report was published. A discussion with the PJM CRO confirmed that the process of advancement is on-going. A number of real-world examples have proven that the role of the CRO and the risk function at PJM is a valuable asset protecting market participants from defaults and markets from disruptions. At PJM, the HSIM model implementation is an important step forward for that continuing process.

VII. ABOUT "BEST" PRACTICES

A company's risk assessment and risk management practices must continually advance as the company's enterprise of businesses change, markets change, and technology changes. Furthermore, risk management practices span a wide range of specific challenges that the risk professionals must address. The risk professional leading a process of continual improvement needs to be able to benchmark specific current practices with the range of alternative practices available. This practice benchmarking process usually involves the use of the term "best" practice. Often confusing to decision makers, "best" is highly dependent on the situation at hand and the objective purpose of the specific practice under study. To help clarify things, the CCRO has recommended the use of the practice benchmarking terms illustrated below:

Figure: Nomenclature for Benchmarking Risk Management Practices



The illustration helps to clarify important concepts related to best practices.
"Best" practices are industry-leading methods deployed at those companies where the most material and complex risks, for the most material and complex products, must be addressed.

"Appropriate" practice refers to a methodology that is appropriate to achieve effectiveness balanced with the level and complexity of risks at hand for a given company. "Best" practices then are also "appropriate" (and widely implemented) by those industry leading companies facing large and complex risks. Those companies with less material risks or less complex risks under consideration may find their "appropriate" practices somewhere to the left of "best".

The challenge for any company is to evaluate where "current" practices lie versus "appropriate" practices that are needed for effective management of the risks the company faces. If to the left of appropriate, then an unfavorable "practice gap" exists which must be closed to avoid unfavorable outcomes.

The historical simulation methodology proposed by PJM that we have been asked to evaluate here, represents an important closure of a "performance gap" which we observed at the time of our GreenHat study at PJM in 2019. Hence we refer to the HSIM model proposed as an "appropriate" practice for PJM's FTR markets at this time.

It is very important to recognize that again, with time if left unattended, current risk management practices may fall behind appropriate. This could again result in a performance gap, which will have to be addressed to keep up with appropriate practices for PJM's FTR markets.

We have found full acknowledgement and understanding of these concepts in PJM's CRO and risk function staff.

PJM's proposed enhancements to its FTR Credit Requirements are a commendable step in the on-going process of advancing its ability to manage the risks of its FTR market for the benefit of the marketplace and the PJM members as a whole. By using Initial Margin calculated using an HSIM model, as the primary tools to establish an effective and reliable scheme of collateral management, PJM presents a risk management system for the FTR markets with important similarities to risk management systems that have been used successfully over many years by risk managers in the listed and OTC financial commodity derivatives and swaps markets.

Q14 Why Should PJM Continue to Enhance its Risk Management Practices to be More Like the Industry Best Practices used by a DCO?

PJM, through its subsidiary PJM Settlement, performs a pre-trade and post-trade role in qualifying new entrants seeking to participate in its FTR markets as meeting current credit standards, and serving as the counterparty to every FTR transaction with the ultimate responsibility to assure financial performance (by using the funding commitments from its non-defaulting PJM members). With respect to FTR transactions specifically, the product for which PJM is performing these central counterparty functions, they are the substantive equivalent to a cleared commodity derivative even though they are not regulated in the same manner.

DCOs have a nearly unblemished record of managing the financial risks of cleared commodity derivatives markets. There have been a few exceptions, including MF Global[11], however even that $1.6 billion default by a clearing member did not result in losses to the market clearinghouse or its other clearing members. It did take time to close out the defaulted MF Global positions, and the financial loss to the markets was limited to wiping out the capital of MF Global.[12]

Given the success that DCOs have had over a long period of time in managing market risks by providing clearing services for commodity derivatives, DCO practices and procedures make an excellent guidepost for how similar risks in the FTR markets can be better managed by PJM, which shares many of the functions and market risk management responsibilities of a DCO. As such, the

[11] *See The MF Global Bankruptcy, Missing Customer Funds, and Proposals for Reform*, Rena S. Miller (Aug. 1, 2013) https://sgp.fas.org/crs/misc/R42091.pdf.

[12] *See MF Global Customers Will Recover All They Lost*, Ben Protess (Nov. 5, 2013) https://dealbook.nytimes.com/2013/11/05/mf-global-customers-will-recover-all-they-lost/ (last visited Dec. 16, 2021),

DCO model of risk management, in particular use of an initial margin regime patterned after those used by risk managers in CFTC-regulated and cleared commodity futures and swaps markets, is the kind of system of risk management to which PJM should aspire.[13]

Q15: How do the margin policies proposed by PJM compare to the CFTC's rules for DCOs contained in Core Principle D on Risk Management, and describe the reason for any material differences?

In the discussion surrounding the granting of the RTO Exemption Order from CFTC jurisdiction, the CFTC found that compliance by the RTOs with FERC Rule 35.47 relating to credit requirements and risk management was similar to compliance with Core Principles applied to a DCO, including Core Principle D (codified in 17 CFR §39.13), and the similarities satisfied the CFTC's concerns about exempting the RTOs from CFTC regulation of their markets.

The CFTC Exemption Order exempting FTRs from CFTC jurisdiction can be found at https://www.cftc.gov/sites/default/files/idc/groups/public/@lrfederalregister/documents/file/2013-07634a.pdf.

Notwithstanding the absence of a regulatory requirement for PJM to satisfy CFTC Core Principle D, PJM is continually evaluating and reviewing its risk management policies related to collateral in the context of Core Principle D as having established an industry "Best Practice."

Core Principle D sets forth standards for collateral (for the sake of this discussion, synonymous with margin), of commodity derivatives of various types and categories. The CFTC requires that a DCO's determination of Initial Margin requirements be a) model-based, not ad hoc, and that the model must b) satisfy at least a 99% Confidence Interval in all cases, and c) be calculated for a coverage period of one, two, five or ten days, depending on the type of commodity derivative product.

In comparing PJM's new proposal with Core Principle D, the following are key points we wish to highlight:

First, PJM intends to use a historical simulation model, which would meet the requirement that a margin methodology be model based.

Second, PJM captures a much longer liquidation period or Margin Period of Risk (auction cycles or two months) than the minimum requirement of Core Principle D. We believe this is appropriate, given the unique nature of FTR markets. The period required to liquidate a portfolio of FTRs into relatively infrequent monthly auctions will necessarily be significantly longer than liquidation periods applicable to other cleared or uncleared commodity derivative markets with much more frequent opportunity for pricing/repricing portfolios and unwinding transactions.

[13] *See* "About best practices" under Q13 of this paper.

Third, PJM intends to initially rely on a Confidence Interval of 97%, with the intent of moving to the higher 99% prescribed by the CFTC for DCOs within a reasonable period of time. In part, this decision to increase the Confident Interval in steps is due to the longer liquidation period (Margin Period of Risk) and the margin costs to FTR market participants associated with covering risk for such a lengthy time period. It is also in part because PJM is prudently avoiding any disruption of the orderly functioning of the FTR markets that might be expected by imposing a sudden increase in margin levels that may shock the market system and possibly force some market participants to unwind FTR positions or to decide not to continue participation in the FTR auctions and FTR markets entirely. It is not in the public interest to have a potentially-avoidable market disruption in the PJM FTR market.

At the same time, PJM has told us they are committed to implementing a 99% Confidence Interval in the future once the additional working capital requirements required to post margin at the 97% CI flow through the market, and additional market data points are input and additional backtesting of the HSIM margin model is performed. The Confidence Interval of 99% may be referred to as an aspiration toward industry best practices. PJM also recognizes that it is not in the public interest for the FTR market to be exposed to another default resulting in losses to PJM members because of an extended delay in moving the FTR Credit Requirements to a 99% Confidence Interval.

We are supportive of using a 97% Confidence Interval as an appropriate practice at this time. We see this as an initial step toward industry best practices while avoiding market disruptions that could be caused by the transition from the old collateral system to the new Initial Margin regime, with a 99% Confidence Interval, in one step. However, for the reasons stated above, we concur with PJM's expressed and appropriate intent to move diligently and on a reasonable timeframe to a 99% Confidence Interval.

Q16: Please elaborate on PJM's use of the historical simulation model.

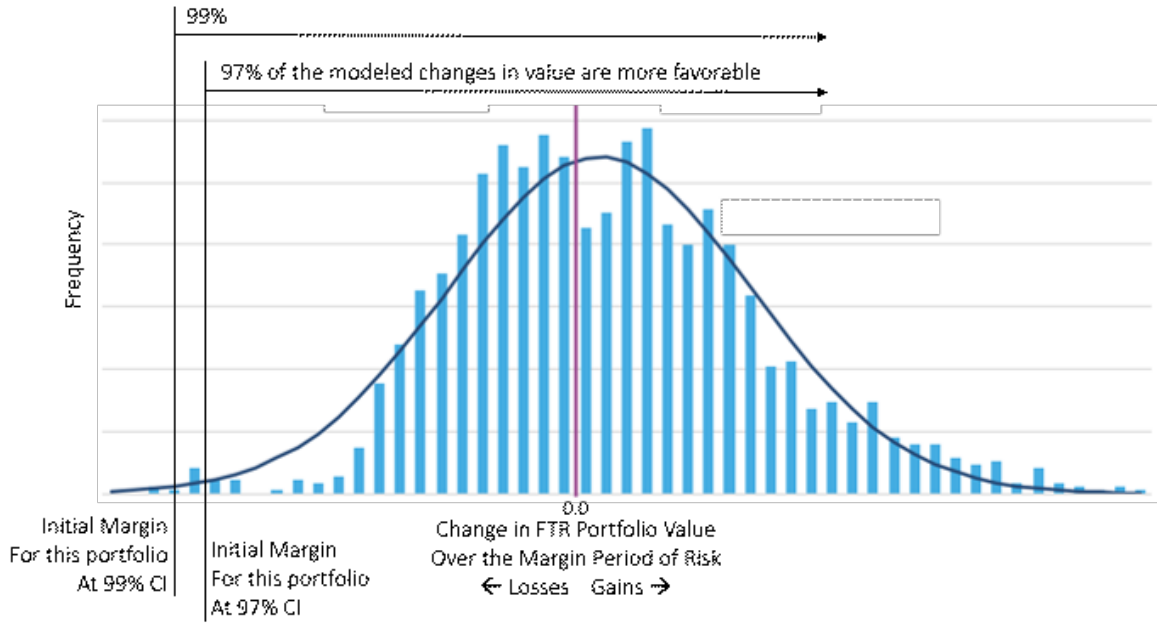
For a given portfolio of FTR positions, the historical simulation method of modeling risk studies historically observed price data in order to estimate potential future financial outcomes for a given portfolio of FTRs. The data inputs to PJM's model are the actual FTR positions in a given market participant's portfolio, and the entire data set of historical auction prices available at each node in the PJM markets since inception of the PJM FTR markets in 2008. Using statistical analysis techniques, the model can estimate financial outcomes for any individual market participant's portfolio of FTR positions based on how those positions would have fared under historically observed price changes.

In addition to the Confidence Interval, a time interval over which market price changes will be measured and applied in the model must be specified. This time period corresponds to the time estimated to be required for a controlled liquidation of the defaulted portfolio into the market. This

is typically referred to as the model's specified "liquidation period", or a "Margin Period of Risk". PJM has provided in its model for two auction periods as the Margin Period of Risk.[14]

The method quantifies a potential dollar amount loss in value which corresponds to a certain level of statistical confidence (the Confidence Interval). So, a desired confidence interval must be specified by the user of the model. For example, PJM is proposing to use a Confidence Interval of 97%. This means that PJM expects that, in 97% of HSIM model-derived outcomes, the financial loss in value on the given portfolio of FTR positions will be less than the quantified dollar amount.

Figure: Illustrative Distribution of Hypothetical FTR Portfolio Outcomes



Given those inputs, the potential dollar amount loss output by the model is used by PJM to set an "Initial Margin" (IM) dollar amount for each participant's portfolio of FTRs. In this example, PJM expects to find that 97% of the time, any portfolio's loss during a possible liquidation period or Margin Period of Risk in the future will be less than that portfolio's Initial Margin held by PJM.

[14] Tariff, Attachment K-Appendix, section 7.3.9.

Q17. Please describe the practical difference between the use of a 97% Confidence Interval level and a 99% Confidence Interval level when used to calculate Initial Margin – both in terms of the aggregate amount of margin that would need to be posted by FTR market participants, and in terms of the risk management benefits for the PJM markets, and consequently for PJM members, taken as a whole.

"Confidence Interval" describes the extent to which the range of possible outcomes is captured by a process. Political polls use a Confidence Interval of + or - some percent to take into account the size of the poll, the possibility of respondents not being forthcoming and other variables. In other words, there is a known risk that the poll may not be accurate in representing actual future outcome.

In the current context of setting an Initial Margin rate, a Confidence Interval is placed on the loss portion of a distribution of potential portfolio value changes. Therefore the effect of moving to a confidence interval further-out (e.g. from 97% to 99%) on the distribution's tail depends on the shape of that portfolio's distribution.

VIII. THE PRACTICAL IMPACT OF 97% VS 99%

Though at first glance, 97% vs 99% may seem trivial in difference, in fact there are significant gains to margin effectiveness for market risk management at 99%.

PJM's analysis[15] has estimated that (using 1Q 2021 data as an example) a 99% confidence interval calls for about 50% more collateral to be posted by FTR market participants in aggregate than a 97% CI. Yet, based on that information, we find the higher CI reduced by 36% the incidence of scenarios with uncovered liquidation losses. Further, the analysis showed that when such uncovered liquidation losses occurred, the potential shortfall dollar amounts in the uncovered loss scenarios (with the shortfall dollar amounts being those which are socialized to all PJM members, whether or not they are active participants in the FTR markets) were three times greater in the 97% tail than in the 99% tail. Because these material uncovered losses are shared among all PJM members, and PJM is concerned that many integrated utilities and LSEs among PJM members must, either directly or indirectly, pass their share of such uncovered market losses on to electric ratepayers, the "practical impact" of using the lower Confidence level (reducing FTR market participants' margin cost requirements) is to increase the potential for inadequate margin coverage and uncovered liquidation losses -- reducing market risk management effectiveness and increasing the potential that PJM members, and their customers, will be forced to absorb possibly significant, market losses.

By design, a 97% CI in the FTR Credit Requirements will allow for potentially more inadequate margin scenarios which may result in more uncovered losses to the PJM markets as a whole and to the PJM members, including those that do not actively participate in the FTR markets. The model-generated scenarios contemplate events captured in historical market data. Unfortunately,

[15] PJM presentation 10/14/2021.

in the PJM markets that are inextricably tied to the physical power markets, the 3% tail which is uncovered may include an extreme weather event like a polar vortex or a Winter Storm Uri event which foreseeably could re-occur. Such extreme but foreseeable events can result in significant commodity derivatives market price swings, which may cause FTR market defaults, which may generate disproportionately large losses which PJM's members do not have the resources to bear. By missing 3% of the outlying events of the past using a 97% CI when setting a protective Initial Margin level, the 97% CI choice knowingly exposes the FTR markets to foreseeable price moves that are not covered by the level of required Initial Margin. Even while the market proceeds without any defaults, the PJM markets as a whole and members of PJM (including non-participants in the FTR market) are effectively providing credit support to FTR market participants by agreeing to backstop losses resulting from a failure in FTR market margin policy.

Moreover, as discussed in the "weaknesses…" section of the answer to Q12, history is not necessarily a good predictor of the future, particularly in the markets for energy commodities and derivatives. Other physical market events which might have a correspondingly significant effect on commodity derivatives markets like PJM might include a physical- or cyber-security event affecting the grid. Even if, hopefully, the likelihood of such an event is small, there is nonetheless a credible risk of future events driving stressful market changes that are more extreme or more frequent than any captured in historical data, and such events could significantly change the loss tail of the portfolio's distribution. Such an unfavorable potential distribution change truly brings focus on the need to move with reasonable speed toward the highest confidence interval applied by market risk managers like DCOs in commodity derivatives markets with more history of market function than is available for the PJM FTR markets.

Regulated DCOs do not accept the same level of risk of uncovered losses when these tail events happen, and are required by regulation to manage and mitigate the risks by using a Confidence Interval of 99%. As stated elsewhere, we view a 97% Confidence Interval at PJM as a stepping stone to avoid market disruption with the clear understanding that PJM intends to move to a 99% Confidence Interval within a reasonable amount of time.

Q18. Should PJM be able to change the Confidence Interval level and under what circumstances?

Any model for determining an appropriate Confidence Interval level will require change over time, or it may not be predictive of conditions as they arrive in real-time. Model results are not static as they show changes in the expected range of prices at different times. A two month forward looking range of prices at a 97% or 99% Confidence Interval may well differ if the next two months are April and May rather than December and January. PJM may need to modify its Confidence Interval

levels as a means of increasing credit requirements on outstanding or open FTR positions to account for changes in the model's forecast of possible price moves over the near future. [16]

In addition to changing Confidence Interval levels because of a seasonality effect on a possible range of prices, PJM may also find that conditions on the ground, and their impact on price moves, is far different from what had been predicted. Given the lengthy period between auctions, PJM may have to wait one or two months to have sufficient price data to see that its model is not effectively capturing price risk as expected at the Confidence Interval in effect.

Collecting Mark to Auction margin to account for a market loss, which is the mark to market of outstanding or open positions based upon the most recent available price information from actual auction results, does not substitute for having an appropriate Confidence Interval level. A Mark to Auction process is intended to recover the erosion in value from auction-to-auction of the Initial Margin amount that was initially posted. If the model predicts a larger range of possible prices, or prices at the auction show greater price movement than predicted, restoring Initial Margin to the level it was set at in the past may not capture the market risk as it exists today. Only a change to Initial Margin will reflect the change in price risk from time to time.

Therefore, as part of our review, we believe that PJM must have the authority to change Initial Margin requirements as its model requires, or as conditions in real time show such a change to be necessary to retain coverage of price risk at the Confidence Interval.

Q19. Please describe the key components of PJM's current FTR Credit Requirement calculation.

The existing calculation is based on five (5) factors: (1) Monthly Path Requirement; (2) Individual FTR Requirement; (3) Un-Diversified Adder and (4) add 10 cent per MWh volumetric minimum charge and; (5) subtracts ARR credits. *See* Tariff, Attachment Q, section VI.C.2.

[16] The publication "CME Clearing Performance Bond Practices," states that "CME Clearing recalculates performance bond [*or "Initial Margin"*] requirements at least once daily for clearing member and customer portfolios, but twice daily in most cases (e.g., for exchange-traded derivatives)...CME Clearing endeavors to make preemptive incremental changes to its performance bond requirements in response to volatility, where possible." *CME Clearing Performance Bond Practices*, CME Group (July 16, 2020), https://www.cmegroup.com/education/articles-and-reports/cme-clearing-performance-bond-practices.html (last visited Dec. 9, 2021).

Notwithstanding its commitment to frequent measurements of appropriate Initial Margin requirements, changes to Initial Margin tend to be periodic, not daily or even weekly or monthly.

Q20: Please describe the drawbacks of the current formulaic model?

PJM's proposal would replace the current formulaic model, in order to advance risk management practices. We see material drawbacks to the current formulaic model, which are overcome by the new proposal.

1) The current formulaic model uses only a limited historical "look-back" range of three years as the basis for establishing required FTR Credit Requirement. This is a narrow historical frame of reference from which to infer possible price moves in the future, particularly considering infrequent extreme weather events, which may now be becoming more frequent if climate change predictions hold true.

2) In addition, the formulaic model accords much greater weight to the most recent year during the historical look-back period than the previous 2 years. Whether a nearby year is more representative of the future than two or three years ago may seem arguable. However, we have not seen any analyses providing quantitative support for the assumption of this particular weighting. Whatever the weighting chosen, the use of weighting is a simplifying assumption, which is undesirable in any case when constructing a model. Thus, the current model is incorporating a simplifying assumption that could lead to both risk evaluation and margin collection errors.

3) The un-diversified adder, an adder for portfolios that are deemed to present heightened risk from being undiversified, introduces another simplifying assumption with potentially significant impact. Subsequent to calculating a tentative cleared solution for an FTR auction (or auction round), PJM determines the FTR Portfolio Auction Value for each customer account of a Market Participant, including the tentative cleared solution. FTR Portfolio Auction Values, calculated on a monthly basis, are the sum across all FTRs, of the FTR price times the FTR volume in MW. Any customer accounts with FTR Portfolio Auction Values that are negative in one or more months shall be deemed "FTR Flow Undiversified." For customer accounts that are FTR Flow Undiversified in a month, PJM increases the FTR Credit Requirement by an amount equal to three times the absolute value of the FTR Portfolio Auction Value in that month, including the tentative cleared solution. This adder attempts to capture an intuitive feature of a portfolio's make up, yet must make a gross oversimplification in order to fit the formulaic approach. Again, the current model may be incorporating a simplifying assumption that could lead to risk evaluation and margin collection errors.

Q21. Please describe the key components of PJM's proposed FTR Credit Requirement calculation?

- The new calculation will be performed on a portfolio basis for each FTR Market Participant based on

- the Initial Margin calculated using the new historical simulation model, using the previously approved two-month Margin Period of Risk, and at a Confidence Interval of 97%.

- The Initial Margin is then adjusted by:
  - Auction Revenue Right ("ARR") Credits
  - Mark-to-Auction Value,
  - Add the 10 cent per MWh minimum volumetric charge, and
  - Any realized gains and/or losses.

Altogether, these components significantly enhance PJM's market risk management practices by implementing the concepts of Initial Margin, as well as adjusting the Initial Margin calculation based on a high Confidence Interval.

Q22: Please describe the benefits of the enhancements to the FTR Credit Requirement.

The proposed enhancements to the FTR Credit Requirements are a significant step forward in aligning PJM's market risk management practices with industry best practices represented by DCOs. The proposed enhancements remove many of the simplifying assumptions of the current formulaic model, accommodate the market's ARR and FTR auction structure, and introduce new modeling capabilities for PJM to better understand the potential risks of FTR portfolios large and small.

- The development and use of the historical simulation model affords PJM's risk management function with an important new tool for insights into the risks in FTR markets.

- The historical simulation model will strengthen with time. PJM's ongoing addition of data points with each FTR auction and validation through backtesting of the model will assure continued accuracy as markets evolve and more data is acquired.

- The proposed requirement uses the maximum available historical price record as the best way to predict the future. It does not arbitrarily assign greater weight to the market effects of some events over others because such events occurred more recently.

- When new auctions occur, open FTR portfolio positions will be marked to current auction prices, and Initial Margin adjusted, to recover any erosion of value against the Initial Margin levels indicated at a prior auction time.

- The application of any ARR credits incorporates an appropriate allowance for the important role of asset-driven FTR market participants.

- A 10 cent per MWh minimum volumetric charge provides a significant cushion against potential market behaviors that are unanticipated and unlike the historical data used in the historical simulation model.

Q23. As a result of your evaluation, please state whether you recommend any changes to the PJM's proposed FTR Credit Calculation

Initially, no. In our opinion, the historical simulation model detailed in the Model Validation Report is appropriate, and reasonable. It is our belief that the enhancements to the FTR Credit Requirements is a material improvement over the status quo for market risk management at PJM.

The initial 97% Confidence Interval proposal is a prudent step forward to avoid collateral shock and market disruption. It is important to give the market participants time to adjust to the new model and the new FTR Credit Requirements for Initial Margin. We expect some participants will need time to modify their FTR portfolios, to secure additional capital or lines of credit, or to increase working capital available for posting as margin. Such financial choices are critical to an ongoing business – whether an LSE, another type of asset-driven FTR market participant, or a financial entity or other liquidity provider, and such financial choices should be made in an orderly, planned manner.

It is our recommendation that PJM ultimately move to a Confidence Interval of 99% within a reasonable period of time, and it is our understanding that PJM intends to do so.

The experience of DCOs, and the regulations concerning use of models, a Margin Period of Risk that reflects the products and markets for which margin is being posted/collected, and a 97% Confidence Interval, shows that PJM is evolving its market risk management practices toward industry best practices, making the FTR Credit Requirement a more effective tool to measure risk and limit the potential fallout from a default by an FTR market participant. At the same time, a 99% Confidence Interval as the basis for determining the Initial Margin is an industry best practice for DCOs, and as such should be the goal for PJM as the market risk manager for an analogous commodity derivatives market like FTRs.

Q24. Do you recommend any other changes to the FTR Credit Requirement calculation?

At this time no, with the caveat that keeping risk management practices up to date and in line with developing industry best practices is a continuing effort:

1) As recommended, the historical simulation model should be validated with backtesting and appropriate adjustments made as part of an on-going planned process of risk management.

2) PJM should regularly review and update its risk management framework.

3) Also as recommended, as more price data is accumulated with time, PJM should evaluate the appropriateness of the Confidence Interval.

Q25. Please summarize your affidavit regarding PJM's adoption of a historical simulation model, with the previously approved Margin Period of Risk of two months, and 97% Confidence Interval.

The rationale behind implementing PJM's Initial Margin methodology using an HSIM model with a 97% Confidence Interval is well-supported for the following reasons:

(1) Historical simulation models are used by DCOs to generate initial margin requirements in CFTC-regulated markets for electricity-related futures contracts, including Nodal and ICE Clear, and for other listed derivatives contracts, as well as by risk managers for major market participants in many over the counter energy commodity and swaps markets.

(2) Due to certain unique attributes of PJM's FTR market structure and practice, margin requirements for participation in PJM FTR markets established using the HSIM model at a 99% Confidence Interval, if implemented in one step rather than gradually, could have unintended consequences for the PJM FTR markets due to the significant difference in margin required using a Confidence Interval of 99% rather than 97%. Some participants could be forced to reduce their participation and/or liquidate some positions in PJM's FTR markets if the initial margin requirements exceed a market participiant's working capital available for margin purposes, and market disruptions could occur as a result.

(2) The 97% Confidence Interval will be implemented as a first step, with a clear understanding that PJM intends to move to a Confidence Interval of 99% within a reasonable period of time.

(3) PJM's experience gained with the historical simulation model during this interim period will allow additional data points to be included into the backtesting of the HSIM model for validation of effectiveness and creating opportunities for any appropriate further enhancements to the FTR Credit Requirement methodology prior to moving to the 99% Confidence Interval.

We have relied on the Model Validation Report to conclude that PJM's historical simulation model is the most appropriate industry standard model available to measure market risk in the absence of a forward looking and liquid options market for FTR products. The two-auction Margin Period of Risk (previously approved by FERC) and a high Confidence Interval is warranted and will be in keeping with the industry best practices of the regulated cleared derivatives markets.

We believe a 97% Confidence Interval is an acceptable step toward an industry best practice 99% Confidence Interval to avoid possible collateral shock and disruption in the FTR markets that are critical to PJM's market structure. It is important to give the current and potential FTR market participants time to adjust to and gain confidence in the new Initial Margin approach. We expect some current FTR market participants will need time to modify their portfolios, secure additional capital or lines of credit, or to increase working capital available for posting as margin. Such financial choices are critical to a business as a going concern, and should be done in an orderly, planned manner.

Given a reasonable period of time, market participants should be able to adjust to the target 99% Confidence Interval in an orderly fashion or by raising incremental capital, if needed, or adjusting operations to take into account the margin requirements of PJM's FTR market. At that point, PJM will be able to enhance its market risk management policies further, and protect the PJM markets, its PJM members and their electric customers with even more confidence against unexpected financial losses.

Our recommendation of the interim 97% Confidence Interval at this time is with the clear understanding that PJM will implement a 99% Confidence Interval within a reasonable period of time.

This concludes our affidavit.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)))	Docket No. ER22-___-000

VERIFICATION

Pursuant to 28 U.S.C. § 1746 (2000), I state under penalty of perjury that I am the Neal Wolkoff referred to in the foregoing "Affidavit of Neal Wolkoff and Robert Anderson on Behalf of PJM Interconnection, L.L.C.," that I have read the same and am familiar with the contents thereof, and that the facts set forth therein are true and correct to the best of my knowledge, information, and belief.

Executed this 17th day of December, 2021.

/s/ Neal Wolkoff

NEAL WOLKOFF

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.	)))	Docket No. ER22-___-000

VERIFICATION

Pursuant to 28 U.S.C. § 1746 (2000), I state under penalty of perjury that I am the Robert Anderson referred to in the foregoing "Affidavit of Neal Wolkoff and Robert Anderson on Behalf of PJM Interconnection, L.L.C.," that I have read the same and am familiar with the contents thereof, and that the facts set forth therein are true and correct to the best of my knowledge, information, and belief.

Executed this 17th day of December, 2021.

/s/ Robert Anderson

ROBERT ANDERSON

Attachment G

Affidavit and Exhibits of Dr. Alex Eydeland
on Behalf of PJM Interconnection, L.L.C.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

	)	
PJM Interconnection, L.L.C.	)	Docket No. ER22-___
	)	

AFFIDAVIT OF
DR. ALEX EYDELAND
ON BEHALF OF PJM INTERCONNECTION, L.L.C.

1 **1. PERSONAL AND PROFESSIONAL QUALIFICATIONS**

2 **Q 1.1 PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

3 A. My name is Dr. Alexander Eydeland.

4 Address: 25 Central Park West, #5S, NY, NY 10023

5 **Q 1.2 BY WHOM AND IN WHAT CAPACITY ARE YOU EMPLOYED?**

6 A. I am employed by PJM as a consultant.

7 **Q 1.3 PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE.**

8 A. I have more than twenty-five years of experience in energy markets including
9 twelve years as a Managing Director at Morgan Stanley in charge of global
10 commodities strategies and analytic modeling, and seven years as a Head of
11 Research at Mirant Corp. I have also consulted for a number of energy companies,
12 did quantitative research projects for various Wall Street firms, and worked as a
13 mathematics professor at the University of Massachusetts at Amherst. I am a
14 coauthor of the book "Energy and Power Risk Management." My papers on risk
15 management have appeared in a number of major publications, and I have lectured
16 extensively throughout the United States, Europe, and Japan.

Q 1.4 PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND.

A. I hold a Ph.D. degree in Mathematics from Courant Institute of Mathematical Sciences.

2. PURPOSE AND SUMMARY OF AFFIDAVIT

Q 2.1 WHAT IS THE PURPOSE OF YOUR AFFIDAVIT?

A. My affidavit is offered to (1) discuss initial margin methodology and provide background on the use of models to calculate initial margin; (2) discuss PJM's adoption of an historical simulation (HSIM) model; and (3) discuss the concept of confidence interval (CI); and (4) describe the extensive back-testing of the PJM HSIM model.

3. BACKGROUND ON INITIAL MARGIN METHODOLOGY

Q 3.1 DESCRIBE INITIAL MARGIN.

A. As further explained in Exhibit A attached hereto,[1] initial margin is the amount of collateral needed to cover the replacement cost of unwinding a market participant's portfolio in the case of default. Replacement cost is the cost incurred during the liquidation period. The liquidation period is the time-period between the last variation margin posting and the complete portfolio closeout time. Initial margin is posted by a trading participant as collateral to protect against the financial consequences of default. It typically represents the potential losses that would be incurred by a central counter-party, like PJMSettlement, Inc., should a participant

[1] Exhibit A: PJM Financial Market Reform Project Desktop Review of Methodologies for Initial Margin Calculation (July 2019).

default. It is calculated with a high degree of statistical likelihood across a participant's portfolio.[2]

Q 3.2 PLEASE SUMMARIZE THE RESULTS OF THE ACADEMIC LITERATURE REVIEW ON THE USE OF MODELS TO CALCULATE INITIAL MARGIN EXPOSURE.

A. As more fully described in Exhibit A attached hereto, there have been many studies that have analyzed the potential exposure of central counter parties. Models that have been developed can be generally categorized into three (3) main categories: (1) statistical models, which assume simple underlying dynamics that derive the probability for the initial margin to be exceeded within a given time horizon: (2) optimization models, which calculate margin in a manner that balances the resilience of central clearing parties against costs to their members; and (3) options pricing based models, which explore the fact that the exposure profile of a central clearing party is approximately equivalent to a combination of "call and put" options because a central clearing party can strategically default if a contract loses more value than the posted initial margin.[3]

Q 3.3 WHAT THEORIES HAVE BEEN CONSIDERED FOR CALCULATING INITIAL MARGIN?

A. As further described in Exhibit A, theories of calculating margin include the Extreme Value Theory (Longin 1999, Broussard 2001), the Standard Portfolio

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[2] Exhibit A at 2.

[3] *Id.* at 3.

Analysis of Risk methodology (Kupiec 1994), the Value at Risk (VaR) based IM system (Barone-Adesi et. al 2002) and the optimal liquidation strategy based on auctioning parts of a portfolio (Cont and Avellaneda 2013).[4] As relevant here, the VaR approach has been found well-suited to assessing the risk that losses on complex portfolios will exceed the specified margin level.

Q 3.4 PLEASE DESCRIBE THE TWO PRINCIPAL APPROACHES TO INITIAL MARGIN CALCULATION.

A. The two main approaches to initial margin calculation include the historical simulation (HSIM) approach and the Monte Carlo (MC) approach. The HSIM approach can be categorized as a VaR-based methodology that is widely accepted in different markets for calculating initial margin and other capital requirements. HSIM model uses Financial Transmission Right (FTR) auction historical data to assess the impact of market moves on a given Market Participant's portfolio. The portfolio is subjected to historically recorded FTR price movements over a specified time period called the margin period of risk. The impact of these price movements is used to generate a distribution of the portfolio value changes. That distribution is then used to calculate the maximum loss corresponding to a fixed confidence level. The loss value determines the initial margin.

The MC approach is based on generating a range of locational margin pricing (LMP) sets using economic software and a set of stochastic primary drivers (load, generation, transmission, fuel prices, etc.). This approach utilizes knowledge

[4] *Id.*

of the statistical properties of these primary drivers to calculate changes to Market Participants' portfolio values under each simulated scenario, and based on this forward looking central counter party risk.[5]

Q 3.5 WHAT ARE THE APPROPRIATE METHODOLOGY GUIDELINES IN SELECTING A METHOD TO CALCULATE INITIAL MARGIN?

A. There are four (4) factors that are objectives of the method selected. These include: (1) margin levels should reflect the risk; (2) margin calculation methodologies should be transparent and relatively simple; (3) margin calculation methodologies should be replicable by counterparties to reduce dispute burdens; and (4) margin methodologies should take into consideration market liquidity.[6] These types of methodologies are generally referred to as VaR or risk-based methodologies. These methodologies are widely accepted in different markets for calculating initial margin and for other capital requirements.[7]

Q 3.6 WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF THE MC METHOD?

A. The advantages of the MC method include broader flexibility and better risk determination. Disadvantages of the MC method include dependence on a choice

[5] *Id.* at 2, 7.

[6] *Id.* at 4.

[7] *Id.* at 5.

of proprietary software, the potential for dispute if results are not easily understood and the high data requirements of its use.[8]

Q 3.7 WHAT ARE THE ADVANTAGES AND DISADVANTAGES OF THE HSIM METHOD?

A. Advantages of the HSIM approach include that it is a standard risk-based approach used in a majority of markets, it is easy to implement, it is a transparent process with a low probability of dispute, and there is no need to determine correlations between paths as they are included in the historical data. [9] Disadvantages include that HSIM is based on historical price behavior, requires substantial historical data, and may generate unfeasible scenarios.[10]

Q 3.8 WHAT ARE THE ADVANTAGES OF THE HSIM MODEL OVER THE MC MODEL APPROACH?

A. One of the strongest arguments in favor of HSIM methodology is that it produces joint distribution of price movements without requiring such inputs as correlation matrix or covariance matrix. Indeed, the correlation coefficients are frequently used in the alternative simulation methods as a step to determine the joint distribution of risk factors underlying the portfolio values. However, often the calculation of the correlation coefficients in a stable way is challenging, and their use in the simulation methodology is questionable, as it implies that the methodology restricts

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[8] *Id.* at 8.

[9] *Id.* at 6.

[10] *Id.* at 7.

itself to a narrow, and potentially inadequate, family of joint distributions of risk factors. The HSIM approach is free from this intermediate step and uses historical data directly to determine the joint distribution of underlying risk factors (FTR prices in our case) without any assumptions or constraints on the choice of this distribution. The HSIM method does not require correlations because, by construction, price movements for each scenario are taken from the same period in the past ensuring correct joint behavior. HSIM has proved to be a reasonable methodology to be considered for computing initial margin.[11]

Q 3.9 WHAT OTHER FACTORS WERE CONSIDERED IN CHOOSING BETWEEN THE HSIM AND MC METHODS?

A. PJM used back-testing, in part, to choose between the different methodologies. Back-testing is a standard method for validating a particular trading or risk management methodology.[12]

Q 3.10 PLEASE DESCRIBE THE PROCEDURE FOR BACK-TESTING INITIAL MARGIN CALCULATION METHODOLOGY.

A. As further described in Exhibit A, back-testing involves a series of steps used to determine whether the methodology objectives described above are achieved by comparing results to a known default occurrence. This back-testing procedure was

[11] Exhibit B: PJM Report: Results of Risk Model Quantitative Analysis (September 24-25, 2019), at 17.

[12] Exhibit A at 6.

used to help PJM choose the most appropriate initial margin calculation methodology. [13]

Q 3.11 UPON ASSESSMENT OF PJM'S FTR MARKET, WHY WAS PJM'S IMPLEMENTATION OF AN HSIM MODEL APPROPRIATE?

A. The HSIM method uses real data. It can capture unexpected "tail" events and correlations that would not necessarily be predicted by a theoretical model. The methodology allows one to model a complex joint behavior of various risk factors that impact portfolio values, making the HSIM method a very effective tool in evaluating and managing risk. PJM's implementation of the HSIM model will help prevent under-collateralization in the PJM markets. Under-collateralization makes markets more vulnerable to defaults, for which PJM Members bear the burden.

Q 3.12 DESCRIBE THE INITIAL MARGIN COMPONENT OF THE CALCULATON AND WHAT IT REPRESENTS.

A. The FTR auction historical price data, from 2008 up to the most recent auction, is used to generate the distribution of a participant's portfolio value changes over the margin period of risk. The distribution is then used to determine the initial margin, defined as the maximum loss corresponding to a prescribed confidence level, i.e., the simulated portfolio losses are not expected, with a given degree of confidence, to exceed the initial margin.

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[13] *Id.*

Q 3.13 DOES THE PJM MODEL INCORPORATE A WEIGHTING COMPONENT?

A. Yes. When the initial margin is computed for the Balance of Planning Period (BOPP), first the initial margins are calculated independently for each month of the BOPP. Then, these monthly initial margins are aggregated into one BOPP margin. The aggregation can be done under two extreme assumptions. First extreme: the monthly losses are completely uncorrelated. In this case the aggregated BOPP initial margin is the square root of sum of squares of individual monthly initial margins ("square root of sum of squares"). Second extreme: the monthly losses are perfectly correlated. Then the aggregated BOPP initial margin is the sum of the monthly initial margins. The current methodology defines the BOPP initial margin as a point between these two extremes. The BOPP initial margin is a weighted sum of these two extreme values. The weights are determined to achieve an optimal balance between the collateral costs to the participants and the attainment of the risk management goals, such as, in particular, a successful passing of the back-test. Currently, the weights are fixed to be 80% for the square root of sum of squares and 20% for the sum of monthly initial margin. The choice of current weights is supported by the back-test results. Different weights were tested, and 80%/20% was the one that satisfied the target failure rate at the lowest collateral cost. In the future the weights may be changed as a result of the regular annual back-testing that incorporates new auction results, or as a result of increased market volatility.

Q 3.14 WHAT IS THE PURPOSE OF THE WEIGHTING COMPONENT OF THE MODEL?

A. As described above, PJM used two approaches to aggregate monthly initial margin values into the balance of planning period, the summation approach and the square root sum approach. PJM used a blended approach to aggregate the monthly initial margin values into the single BOPP initial margin. This blending formula is designed to bring the back-testing results into the desired range. The choice of methods is driven by the goal to have as small a perturbation of square sum of squares formula as possible.[14]

4. CONFIDENCE INTERVAL

Q 4.1 HOW DOES THE CHOICE OF THE CI IN THE PROPOSED METHODOLOGY IMPACT THE MARKET PARTICIPANTS' SHARED BURDEN IN CASE OF DEFAULT?

A. The higher the CI, the lower the expected burden to participants in the case of default, while a lower confidence level poses a higher risk to participants.

Q 4.2 DOES THE NUMERICAL VALUE ASSOCIATED WITH THE CI MATTER?

A. Yes. As mentioned above, a higher CI poses a lower risk to participants and a lower CI poses a higher risk.

[14] Exhibit C: PJM Initial margin and FTR Credit Requirements, Alex Eydeland & Bridgid Cummings, Financial Risk Mitigation Senior Task Force (September 29, 2020), at 7.

5. BACK-TESTING OF THE PROPOSED MODEL

Q 5.1 WAS THE PROPOSED MODEL SUBJECTED TO BACK-TESTING?

A. Yes. The model was back-tested using available historical data.

Q 5.2 WHAT IS THE PURPOSE OF BACK-TESTING THE MODEL?

A. The purpose of back-testing is to validate the model and to verify that in practice the model performance is consistent with its theoretically expected characteristics, i.e., that in practice the model behaves as is expected in theory. Back-testing the model is a standard method for validating a particular trading or risk management methodology.[15]

Q 5.3 WHAT WERE THE RESULTS OF THE BACK-TESTING?

A. The principal objective of the back-testing was to analyze if the initial margin collected after any past auction during the test period for a given participant's portfolio was sufficient to cover potential portfolio losses over the margin period of risk, should the participant default after this auction. If the initial margin was not sufficient, this outcome was counted as a failure. Likewise, a failure rate is the percentage of times initial margin was less than an actual loss. The back-testing results are considered to be satisfactory if the total failure rate is in agreement with the model CI. In the performed back-testing, the failure rate did not exceed 3%, which is consistent with the model CI = 97%, and it did not exceed 1% for CI = 99%. These results allow us to conclude that back-testing supports the model methodology.

[15] Exhibit A at 6.

As further described in Exhibit B, PJM also back-tested results for 10,724 zonal path prices. The number of failures was 139 indicating a failure rate of .013. This .013 failure shows the HSIM is a reasonable method for computing initial margin. PJM also back-tested the model against the known results of GreenHat's long-term portfolio. PJM's analysis revealed that beginning in 2018, the initial margin requirements for GreenHat long-term portfolio was approximately $80 million. This figure combined with other collateral requirements required by GreenHat, indicated the HSIM model is operating as intended.[16]

Q 5.4 DID PJM PERFORM ADDITIONAL BACK-TESTING?

A. Yes. PJM performed additional back-testing and shared results with the Financial Risk Mitigation Senior Task Force on September 20, 2020. This subsequent back-testing confirmed previous results and additionally determined that (1) there was no concentration of failures within a particular subset of participants; (2) when failures occur, no single participant stands out and failures are evenly distributed; and (3) the failures are not clustered within a small group of participants.[17]

Q 5.5 WAS THE MODEL INDEPENDENTLY VALIDATED?

A. Yes. The PJM Model was submitted to and validated by the consulting firm of KPMG. KPMG validated that the model operated as intended and that the results of the model were as expected.

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[16] Exhibit B at 16.

[17] Exhibit C at 9.

Q 5.6 DOES THIS COMPLETE YOUR AFFIDAVIT?

A. Yes, it does.

Exhibit A

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Financial Market Reform Project
Desktop Review of Methodologies for Initial Margin Calculation

July 2019

1 Purpose

This paper examines the pros and cons of potential approaches for the calculation of initial margin for participant FTR portfolios, and recommends two options to proceed forward with for development of proof-of-concept models and associated back-testing.

2 Summary

Margin is the amount of **financial** collateral deposited by a market participant with the Central Counter-Party (CCP) to collateralize trade exposures introduced by the participant. Margins are the CCP's first line of defense in the event of the market participant's default, to satisfy the financial obligations of that participant. The margins are designed to cover the market risk of a market participant's portfolio with high level of confidence. There are two principal forms of margin: Variation Margin (VM) and Initial Margin (IM).

Initial Margin is the main focus of this paper. IM is the amount of collateral needed to cover the 'replacement cost' of unwinding a market participant's portfolio in the case of default. These are the costs incurred during the liquidation period – the time period between the last VM posting and the complete portfolio closeout time.

In this paper we describe two principal approaches to IM calculation: Historical Simulation (HS) approach and Monte-Carlo (MC) approach. In the Historical Simulation method, past auction price volatilities are used to calculate the CCP's exposures during the liquidation period.

The Monte-Carlo approach is based on generating a range of LMP sets using economic dispatch software (PROMOD, PLEXOS, etc.) and a set of stochastic primary drivers: load, generation, transmission, fuel prices, etc. This approach would utilize knowledge of the statistical properties of these primary drivers to calculate changes to market participants' portfolio values under each simulated scenario, and based on this, forward looking CCP risk.

In this paper both methods are described, together with the methodology for their validation.

3 Initial Margin

Initial Margin (IM) is a good-faith deposit, posted by a trading participant as collateral to protect against the financial consequences of default. It typically represents the potential losses that would be incurred by the counter-party – or frequently, as in this case, the Central Counter-Party (CCP) – should the participant default, calculated to a high degree of statistical likelihood, across the participant's entire portfolio. In order to do this, it must cover the time period between when the position was incurred or variation margin (VM) last levied (whichever is the latter), and when it could be liquidated or taken to final settlement (whichever is the sooner) in the event of default. This time period is called the Market Period of Risk (MPOR), and is also known as "liquidation period".

The correct calculation and levying of IM is an essential – but not the sole – defense in protecting the market from the failure of any of its individual participants.

4 Review of the Academic Literature[1]

Early models quantifying potential exposure of Central Counter-Parties (CCPs) can be divided into three main categories:

- Statistical Models: assume simple underlying dynamics, such as geometric Brownian motion, and derive the probability for the IM to be exceeded within a given time horizon. For instance, Figlewski (1984) calculated the probability of a margin call given a certain percentage of Variation Margin (VM) and Initial Margin (IM).
- Optimization Models: calculate margins in a way that balances the resilience of CCPs and costs to their members. For example, Fenn and Kupiec (1993) and Baer et al (1996) built models along these lines by minimizing the total sum of margin, settlement and failure costs.
- Option Pricing-Based Models: explore the fact that the exposure profile of a CCP is approximately equivalent to a combination of call and put options because a GCM can strategically default if the contract loses more value than the posted IM. (This is largely a theoretical possibility.) Day and Lewis (1999) used this framework and estimated prudent margin levels for specific instruments.

When designing its defenses, a CCP has to analyze losses conditional on exceeding margins. By its very nature, extreme-value theory (EVT) can be used for this purpose; it has been exploited by several researchers (see, for example, Longin 1999; Broussard 2001). While the use of EVT to set up margins for a single contract is straightforward, it is much more difficult to do this at a portfolio level. Accordingly, CCPs tend not to use EVT directly, relying instead on the intuitive Standard Portfolio Analysis of risk (SPAN) methodology and its variations (see Kupiec 1994). In practice, SPAN has severe limitations when applied to complex portfolios. The value-at-risk-based (VaR-based) IM system, which is better suited for such a task, was discussed by Barone-Adesi et. al. (2002).

More recently, some fundamental topics related to the clearing process have come into focus. For instance, Duffie and Zhu (2011) questioned the premise that central clearing of OTC derivatives can substantially reduce counterparty risk. They argued that some of the expected benefits are lost due to the fragmentation of clearing services, since there is no allowance for interoperability across asset classes and/or CCPs. They argued that the benefit of multilateral netting among many clearing participants across a single class of derivatives over bilateral netting between counterparties across assets depends on the specifics of the clearing process and could be absent in practice.

Arnsdorf (2012) showed that a clearing GCM's CCP risk is given by a sum of exposures to each of the other clearing members, which arises because of the implicit default insurance that each member has provided in the form of mutualized, loss sharing collateral. He calculated the exposures of GCMs by explicitly modelling the capital structure of a CCP as well as the loss distributions of the individual member portfolios. Arnsdorf assumed that all GCMs are equivalent, which is not the case in practice.

Cont and Avellaneda (2013) developed an optimal liquidation strategy for a defaulted GCM portfolio that is based on auctioning parts of the portfolio, unwinding other parts and selling the rest on the market. They modelled an auction with limits on how many positions can be liquidated on a given day due to liquidity considerations, and determined an optimal sale strategy to minimize market risk by using linear programming.

[1] This synopsis and more can be found in the paper by A. Lipton, "Systemic Risk in Central Counterparty Clearing House Networks", *Margin in Derivatives Trading, Ch. 16,* Risk, 2018.

Cumming and Noss (2013) assessed the adequacy of CCPs' default resources and concluded that the best way to model a CCP's exposure to a single GCM in excess of its IM and DF contribution is to use EVT. They drew a simple analogy between the risk faced by a CCP's default fund and that borne by a mezzanine tranche of a collateralized debt obligation (CDO) and used an established framework to model codependency of defaults based on a gamma distribution. Their model is a useful step towards building a proper top-down statistical framework for evaluating the risk of a CCP's member exposures.

Ghamami (2015) introduced a risk measurement framework that coherently specifies all layers of the default waterfall resources of typical derivatives CCPs, and produced a risk sensitive definition of the CCP risk capital.

Berlinger et al (2017) analyzed the effects of different margin strategies on the loss distribution of a CCP during different crises and found that anti-cyclical margin strategies might be optimal not only for regulators aiming to reduce systemic risk, but also for CCPs focusing on their micro-level financial stability.

Menkveld (2017) emphasized the fact that CCP risk management does not account for risks associated with crowded positions. He proposed an exposure measure based on tail risk in trader portfolios, which identifies and measures crowded risk and assigns it to traders according to the polluter-pays principle.

Lipton (2018) analyzed the pros and cons of moving trade execution, clearing and settlement to blockchain and concluded that the advantages of such a move are not as clear-cut as its proponents claim. Still, by using permissioned private ledger(s), costs can potentially be cut and the speed of clearing and settlement somewhat increased while the number of failures can be reduced.

5 Methodology Guidelines and Requirements

Objectives:

- Margin levels should correctly reflect the risk
- Margin calculation methodologies should be transparent and relatively simple
- Margin calculation methodologies should be replicable by counterparties to reduce dispute burdens
- Margin methodologies should take into consideration market liquidity and concentration

Guidelines from other markets:

- The BCBS-IOSCO guidelines (BCBS-IOSCO, 2015) define the IM requirement as an amount that "covers potential future exposure for the expected time between the last Variation Margin (VM) exchange and the liquidation of positions on the default of a counterparty". It is further specified that the calculation of this potential future exposure "should reflect an extreme but plausible estimate of an increase in the value of the instrument that is consistent with a one-tailed 99% confidence interval over a 10-day horizon, based on historical data that incorporates a period of significant financial stress".

  Note. The 10-day horizon in the guidelines above is the suggested length of the liquidation period for the markets trading frequently. The liquidation period for the FTR market will be substantially larger. We will also investigate the choice of confidence interval in the context of FTRs.

Methodologies similar to the one outlined in the above guidelines are called VaR-based methodologies (or, risk-based methodologies) and are widely accepted in different markets for calculating IM and for other capital requirements. We note that after choosing the target percentile, the collateral (capital) required for insurance against default or other adverse market events can be computed in several ways. It can be just the value corresponding to this percentile (VaR), or it can be the expected value of losses exceeding VaR. This expected value, called *expected shortfall* (ES), has recently become more and more frequently used in regulatory guidelines for capital requirements. For example, it is universally used for calculating regulatory capital under FRTB IMA guidelines.

Regardless of the choice of the capital calculation, one step is common – calculating the change (over the MPOR) in the MTA value corresponding to the target percentile. That step, in turn, requires determination of the distribution of these MTA value changes. More precisely, at time *t* (time of current auction) we need to determine the distribution of the random variable

$$d_t = MTA_{t+MPOR} - MTA_t \#(1)$$

Two principle ways of generating this distribution will be described in this paper – a method based on historical simulations, and one based on Monte-Carlo simulations.

6 Historical Simulation Approach

In this approach we use the historical time series for auction prices for all auction times preceding the current time *t*.

6.1 Simple Historical Simulation

Using historical time series of auction prices, we compute the changes of portfolio MTA values over the MPOR for all times $\tau,\ \tau \leq t$, in our time series:

$$D_\tau = MTA_\tau - MTA_{\tau-MPOR}$$

- Sort D_τ and find the one corresponding to target percentile.
- Compute IM using VaR or ES approach.

6.2 Historical Simulation with Scaling: FHS (filtered historical simulations)

In this method we scale by the ratio of current volatility and long-term volatility to account for *procyclicality*.

6.3 Using Stress Period

In this method we use changes over the worst historical period (worst year, two years …) to get more conservative values of IM.

6.4 Liquidity Adjustment

Liquidity is taken into account by introducing liquidity horizons (*LH*) for each path and product, and by scaling historical changes by a factor proportional to $\sqrt{LH}$. The meaning of *LH* is that for certain paths/products the time to unwind is greater than for others.

LH values are typically the same for a specified group. We assign the lowest *LH* to the most liquid paths and higher values to the less liquid paths. Determining *LH* groupings and values will be one of our principal tasks.

6.5 Market Concentration Adjustment

Another objective of this project is to determine how to account for a concentrated trading position, i.e., a position that constitutes a large percentage of the total market exposure to the underlying product.

6.6 Generating Historical Time Series

Generating reliable historical time series is a key step for the success of HS methodology. This step requires proper concatenating, cleaning and analysis of various data streams as well as potential bootstrapping and proxying.

6.7 Validation of the Methodology: Back-Testing

Back-testing is a standard method for validating a particular trading or risk management methodology. We will also use it to choose between different IM methodologies under consideration.

For a given IM methodology the back-testing procedure works as follows.

- We fix a particular time *t* in the past and calculate IM using historical data for times preceding *t*.
- We then assume that default happens at time *t* and it takes a time period equal to MPOR to unwind the position.
- We then compare the loss during MPOR with the computed IM.
- We repeat this test for a number of times *t* and compute a percentage of times IM was less than actual loss.
- We check if this frequency is consistent with target risk percentile fixed in IM calculation methodology.

The comparison of these statistics for different methodologies also will allow us to choose a better IM methodology.

In addition to the procedure above we will include back-testing of a known default occurrence. Our goal is to analyze the performance of the IM algorithm during that time.

6.8 Final Thoughts about Historical Simulations Approach

Pros

- Standard risk-based approach used in majority of markets.
- Easy to implement.
- Transparent; low probability of dispute.
- No need to determine correlations between paths as there are built in the historical data.

Cons

- The method is based on historical price behavior; assumes stationarity; does not. take into account present and future systemic changes.
- Requires substantial historical data which may not be available.
- May generate unfeasible scenarios.

7 Monte-Carlo (MC) Simulation Approach

In this section we describe an alternative approach to simulating CCP exposure to a market participant over the MPOR. The main idea underlying this approach is that the congestion component of the LMP price at any node is a function of fundamental drivers, such as nodal loads, generation and transmission constraints, fuel prices, etc. Once the values of these fundamental drivers are specified, we can run an optimization program, such as PROMOD, PLEXOS, etc., to determine economic dispatch solution and LMP prices at every node x, and particularly its congestion component (*CLMP*)

$$c^x = \Phi(L^y, \dots, G^z, \dots, T^b, \dots U)\#(2)$$

where L^y denotes the load at a node y, G^z denotes generation constraints at the node z, T^b is the transmission constraint at the branch *b* and *U* is the vector of fuel prices.

The consequence of our ability to generate CLMPs as a function of primary drivers is that for any given path we can generate the distribution of CLMP price differentials for that path by generating the distribution of the primary drivers over the MPOR. The benefit of this approach is that the statistical properties of primary drivers (loads, fuel prices) are stable and their distribution can be reliably validated. Having the distribution of the path prices over MPOR will allow us to simulate the distribution of a market participant's portfolio values, which ultimately will lead us to the calculation of the IM.

We suggest two approaches to generation of the distribution of the primary drivers.

7.1 Using Historical Data to Generate Distributions of Primary Drivers

Let *t* denote the current date. We need to generate the distribution of the future primary drivers, say loads, for the month $t + MPOR$. We will produce this distribution by applying historical load changes over the same period to the expected load for the month $t + MPOR$. After the distribution for loads is constructed, we generate the distribution of FTR prices

Again, the advantage of the historical approach is that the distributions used in this approach are not parametric and we don't need to determine correlations between these drivers at different locations. Moreover, compared to the historical price simulation methodology the advantage of this approach is that statistical characteristics of primary drivers are much more stable than those of the prices, and thus, historical distribution of these drivers are more stable and reliable.

7.2 Using MC Simulations to Generate Distributions of Primary Drivers

In this approach we use pure MC simulations to generate joint distribution of LMP primary drivers. This approach allows us to generate as many scenarios as our hardware and efficiency of our software will allow us, thus, giving us an increased degree of confidence that we will cover most of the adverse future scenarios. In addition to scenarios on loads, generation and fuel prices we can also consider scenarios

impacting grid topology. We should note here that even the pure MC simulations involve the usage of the historical data. We need it to determine parameters of the joint distribution, particularly, the correlation between different drivers.

7.3 Validation of the Methodology: Back-Testing

The back-testing methodology for MC approach is the same as the one proposed for HS methodology (see Section 6.7).

7.4 Add-Ons

Additional modifications, such as liquidity adjustments and concentration adjustments, will be considered for implementation as part of the MC approach, in the same way they are considered for the HS method (see Sections 6.4, 6.5).

7.5 Final Thoughts about MC Simulations Approach

Pros

- More flexibility; broader set of scenarios.
- Better risk determination; can better capture fat tails of loss distribution as we can analyze scenarios that HS cannot.

Cons

- Dependence on a choice of proprietary software.
- Potential for dispute if results are not easily understood (Solution: need to find a transparent way to communicate the process).
- More computationally intense; data requirements are high.

Exhibit B

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Report: Results of Risk Model Quantitative Analysis

Initial Margin

Part 1: Historical Simulation Approach

Alex Eydeland
Financial Risk Mitigation Senior Task Force
September 25, 2019

Purpose

- This paper examines the implementation of a Historical Simulation (HS) methodology for Initial Margin (IM) calculation via the development of proof-of-concept models and associated back-testing.
- The full paper is available here: https://www.pjm.com/-/media/committees-groups/task-forces/frmstf/20190925/20190925-item-07-results-of-risk-model-quantitative-analysis.ashx

Introduction: Variation Margin and Initial Margin

- Margin is the amount of **financial** collateral deposited by a market participant with the Central Counter-Party (CCP) to collateralize trade exposures introduced by the participant. There are two principal forms of margin: **Variation Margin (VM)** and **Initial Margin (IM)**.
- **Variation Margin (VM)** has been described in the Variation Margin and Post-Auction Settlement Discussion Paper. Key features of any variation margin methodology:
  - At the time of the variation margin posting the combined value of the participant's portfolio and the cash in the variation margin account is never negative. In other words, if the CCP unwinds the participant's portfolio precisely at the moment of variation margin posting, there will be no losses to the CCP.
  - Variation Margin is a **forward-looking quantity**. Its value is connected to the Mark-to-Auction value of the participant's portfolio, which in turn is determined by the participants' expectation of future conditions affecting LMPs, including expectations of future demand, generation, fuel prices, outages and changes in grid topology.

Introduction: Variation Margin and Initial Margin

- **Initial Margin (IM)** provides further protection in case the market participant is not able to post Variation Margin, hence triggering default.
- **IM** is a good-faith deposit, posted by a trading participant as collateral to protect against the financial consequences of default. It reflects potential losses that would be incurred by the participant's counter-party (in our case, by CCP) should the participant default, calculated to a high degree of statistical likelihood, across the participant's entire portfolio.
- **IM** must cover the period between the time when the position was incurred or variation margin (VM) last levied, and the time when the position could be liquidated or taken to final settlement (whichever is sooner) in the event of default. This time period is called the **Margin Period of Risk (MPOR)**, and is also known as "liquidation period".
- **IM** is computed at the time of every auction and, if necessary, more frequently.

Notation

- Monthly auctions.
  - For each planning year there are 12 monthly auctions from May to April of the next year at times $t^{mo}_{May}, \dots, t^{mo}_{April}$.
- Annual auctions.
  - For each planning year there are 4 rounds of annual auctions at times $t^{An}_{1}, \dots, t^{An}_{4}$.
- Long Term Auctions.
  - For each planning year YYYY/YYYY+1 there are three rounds of auctions for the long term FTR contracts covering planning years: YYYY+1/YYYY+2, YYYY+2/YYYY+3, YYYY+3/YYYY+4.
  - The times of these rounds are denoted $t^{LT}_{1}, t^{LT}_{2}, t^{LT}_{3}$.

Notation

- Cleared prices per auction or auction round:
  - $P(t_i^{mo}, MMYYYY)$: $MMYYYY$ – month and year of *monthly* FTR contract
  - $P(t_i^{An}, YYYY^{An})$: $YYYY^{An}$ –contract year of the *annual* contract
  - $P(t_i^{LT}, YYYY_1^{LT}), P(t_i^{LT}, YYYY_2^{LT})$ $P(t_i^{LT}, YYYY_3^{LT})$:
    $YYYY_1^{LT}, YYYY_2^{LT}, YYYY_3^{LT}$ are three years of the *long term* contract.

- **Example 1**. FTR contracts bid in the AUG 2018 monthly auction on 07/16/2018 will include Aug2018, Sep2018, Oct2018, Nov2018, Dec2018, Jan2019, Feb2019, Mar2019, Apr2019, May2019.
- **Example 2**. The four rounds of the 18/19 Annual auction run during April of 2018 will clear the price of the annual FTR contract for the 2018/2019 planning year.
- **Example 3**. The three rounds of the 19/22 Long Term auction (Jun, Sep, Dec) of 2018 will clear the prices of the long term FTR contracts for the planning years 2019/2020, 2020/2021, 2021/2022.

Notation

- To unify the notation all prices described above can be denoted as

$$P_{\mu}(t_i, T_k; \tau)$$

- μ is the index of a particular path;
- t_i is the auction date of the auction i ;
- T_k is the beginning of the FTR period, $t_i < T_k$;
- τ is the length of the FTR period (e.g., 1 month, 1 year);
- $P_{\mu}(t_i, T_k; \tau)$ is the price for the path μ cleared during the auction i at time t_i; the price is for the contract that starts at $T_k$and has duration τ.
- $t_i \leq T_k$ where $t_i < T_k$ is the case of auction cleared prices, while $t_i = T_k$ means the settled price.
  - **Example.** If t_i is 07/16/2018, T_k is 12/01/2018, $\tau = 1$ *month*, then $P_{\mu}(t_i, T_k; \tau)$ denotes the FTR price for the path μ cleared during July 2018 monthly auction for the December 2018 contract.

Simulations using Historical Data: Methodology
Monthly Auctions

- Period duration $\tau = 1$ *month.*
- Historical data for HS method: 2006 - 2019. For each planning year since 2006/2007 we have path prices $P_{\mu}(t_i, T_k; 1m)$.
- $t_i < T_k$. To increase the data set $t_i = T_k$ is allowed. In this case the "auction price" is the settled price for the month i.

- Assume that participant's portfolio **Π** includes paths $\{\mu_1, \mu_2, \dots, \mu_m\}$. The HS method requires to construct many scenarios of how current auction prices for these paths will change over the specified MPOR (**margin period of risk**, a.k.a **liquidation period**). MPOR can be 2,3, or more months.

Simulations using Historical Data: Methodology

Monthly Auctions

- How to compute the scenarios?
  - Choose a planning year in the past
  - Choose a contract month T_k in that planning year
  - Choose an auction month i and corresponding auction time t_i. The choice of the auction month is constrained by the requirement that $t_{i+MPOR} \leq T_k$.
  - Compute the changes for each path over MPOR:

$$D_{\mu}^{scen} = P_{\mu}(t_{i+MPOR}, T_k; 1m) - P_{\mu}(t_i, T_k; 1m), \quad scen = 1,2, \ldots$$

  - Create as many scenarios as possible by varying planning years and contracts
  - Apply these historical price moves to current auction prices to generate forward distribution of auction prices – each scenario corresponds to a set of potential auction prices at the end of MPOR over all paths in the portfolio.

Simulations using Historical Data: Methodology

Monthly Auctions

- **The main question:**

  Assuming that we need to liquidate the market participant's portfolio Π by the end of the MPOR, what would be our exposure with a high degree of confidence?

  In other words, we need to state that with high probability our losses will not exceed δ during the liquidation period. Then, requesting the participant to post IM that is greater than or equal to δ, we ensure that we are protected with high degree of confidence in case the participant defaults and we need to liquidate by the end of MPOR.

  To determine this critical loss level we will compute portfolio values for all price scenarios; then compute corresponding deviations of these values from the current portfolio value; rank these deviations and, finally, find the level such that percentage of scenarios with losses below this level does not exceed a small number (say, 1%).

Simulations using Historical Data: Methodology
Monthly Auctions

- For all price scenarios compute

$$\Delta\Pi^{scen} = \Pi(scenario\_prices) - \Pi(current\_prices)$$

- Find δ such that

$$\Pr(\Delta\Pi^{scen} < \delta) = 1\%$$

- **Initial Margin.** Once we determined that 99% of portfolio deviations over MPOR are above δ, the *initial margin (IM)* is defined as follows:

$$IM = Const \cdot \delta$$

where *Const* is a pre-fixed scaling factor, greater than or equal to 1.

Simulations using Historical Data: Methodology

Annul and Long Term Auctions

- **Annual Contract.** As we enter a given planning year, we determine the IM for the remaining balance of the corresponding Annual contract by splitting it into the monthly contracts and determining IM the same way we did it for monthly contracts.
- **Long Term Contract.** Similar methodology as in the case of monthly contracts with the following modifications:
  - $\tau = 1yr$ and not $1m$
  - t_i is the time of a particular round of LT auction
  - $MPOR$ is now 6-9 months.

Price Scenario Structure

- ***conYYYY, conMM*** - year and month of the contract under consideration;
- ***inAucYYYY, inAucMM*** – year and month of the auction when we enter the contract;
- ***inPromptNum*** – the distance in months from the in-auction month to the contract month;
- ***outAucYYYY, outAucMM*** – year and month of the auction when we exit the contract (including the possibility of getting settled prices in the contract month);
- ***outPromptNum*** – the distance in months from the out-auction month to the contract month;
- ***MPOR*** – margin period of risk, the period between in-auction and out-auction;
- ***PriceIn, PriceOut, Diff*** – respectively, the price of the contract cleared in the in-auction, the price of the contract cleared in the out-auction and the difference between those prices.

conYYYY	conMM	inAucYYYY	inAucMM	inPromptNum	outAucYYYY	outAucMM	outPromptNum	MPOR	PriceIn	PriceOut	Diff
2017	**5**	2017	2	3	2017	5	0	3	1.4508	1.9109	0.46017

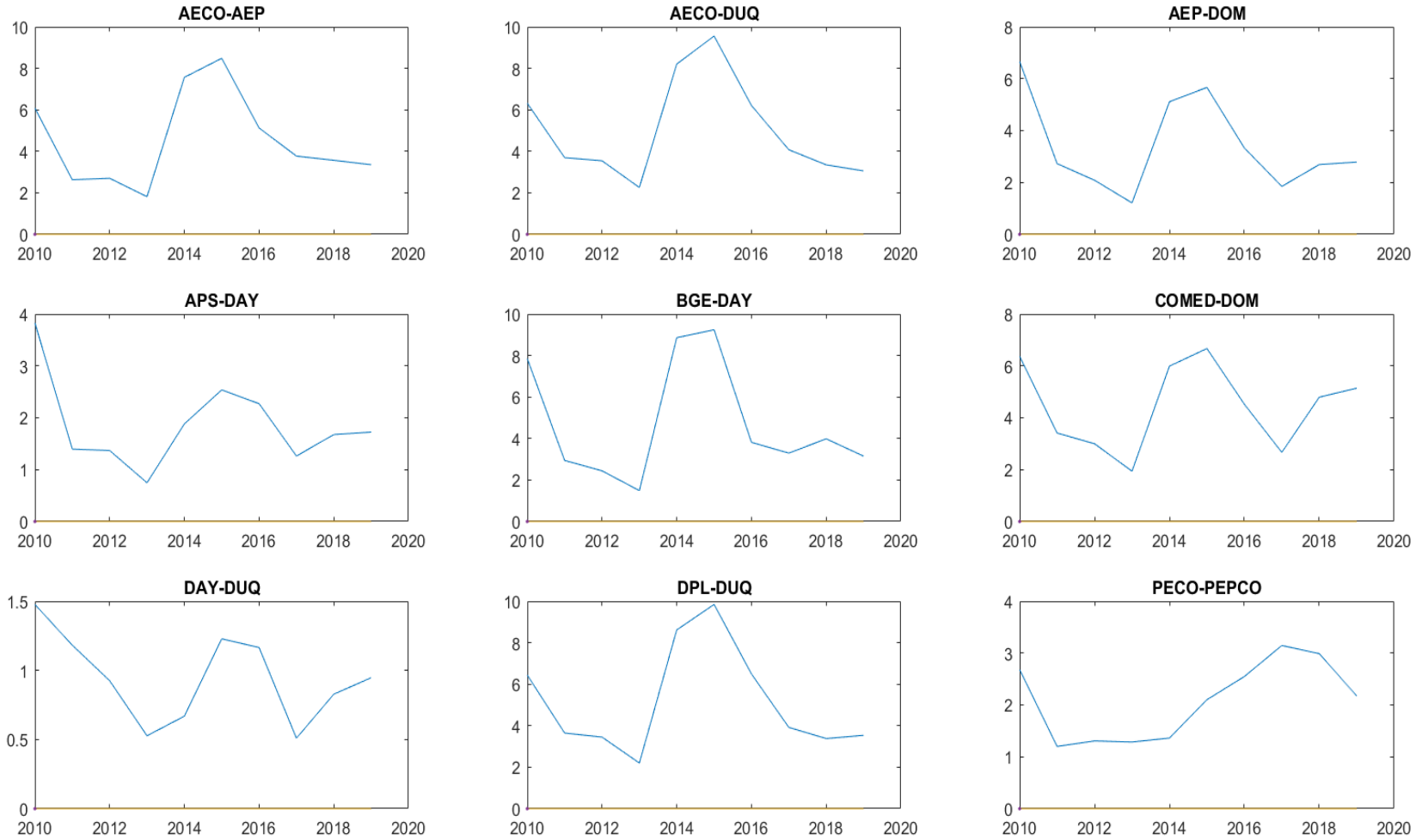
Properties of Historical Price Movement Distributions

- The analysis of price distributions, as well as all back tests, except the last one, will be performed on zonal paths, due to the fact that the historical data for zonal prices is more reliable and readily available.
- Ultimately, we intend to perform similar analysis on all paths relevant to participants' portfolios.
- In this presentation, most of the analysis and test results are given in a reduced form. The full set of results can be found in the paper in the Appendix.

- First question: was there a systemic change in price volatility? For example, was there steady increase or decrease in volatility?

Two-year moving window volatility of monthly FTR prices for zonal paths

- No manifested systemic change in volatility (to be continuously monitored)



Properties of FTR Price Distributions

- Standard deviation, first percentile, and kurtosis of the zonal path FTR price distributions. *MPOR* = 2.

PATH	STD	1%	Kurtosis
AECO-AEP	4.19	-10.19	102.3
AEP-BGE	4.56	-12.09	121.66
APS-DOM	2.23	-5.92	60.11
DOM-DUQ	4.02	-11.64	42.47
PENELEC-PEPCO	3.28	-8.21	97.12

Term structure of FTR Price Volatility

- Volatility decays for farther contracts. Standard deviation for each FTR contract is calculated for the distribution corresponding to MPOR=2

PATHS	Auction month + 2	Auction month + 3	Auction month + 5	Auction month + 7	All
AECO-AEP	8.50	2.92	2.50	2.19	4.19
AEP-DPL	8.79	3.08	2.46	2.24	4.33
DOM-DUQ	7.81	3.07	2.36	2.42	4.02
PECO-PEPCO	3.77	1.78	1.27	1.17	2.02
PENELEC-EKPC	4.28	1.67	1.06	0.60	2.00

Back-Testing

- Back-testing is a standard method for validating a particular trading or risk management methodology. The back-testing procedure works as follows:
  - Fix a particular time *t* in the past and calculate IM using historical data for times preceding *t*.
  - Assume that a default happens at time *t* and it takes a time period equal to MPOR to unwind the position.
  - Compare the loss during MPOR with the computed IM.
  - Repeat this test for a number of times *t* and compute a percentage of times IM was less than actual loss.
  - Check if this frequency is consistent with target risk percentile fixed in IM calculation methodology.

Back-Testing

- Back-testing results for zonal path prices. MPOR = 2, inPromptNum = 3

PATH	# TESTS	# FAILS
AECO-AEP	62	0
AECO-APS	62	0
AECO-BGE	62	0
AECO-COMED	62	0
AECO-DAY	62	0
AECO-DOM	62	1
AECO-DPL	62	2

- **Total Number of Tests = 10724**
- **Total Number of Fails = 139**
- **Fails/Total = .013**

Back-Testing

- ***Const*** = 125%

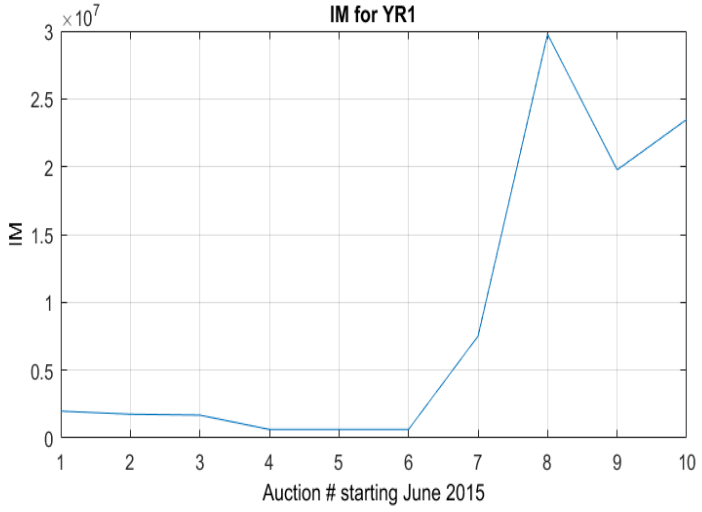
MPOR	inPromptNum	numFails/numScenarios
2	2	0.0092
2	3	0.0053
2	4	0.0043
2	5	0.0034
2	6	0.0029
2	7	0.0026
3	3	0.0041
3	4	0.0042
3	5	0.0038
3	6	0.0035
3	7	0.0032

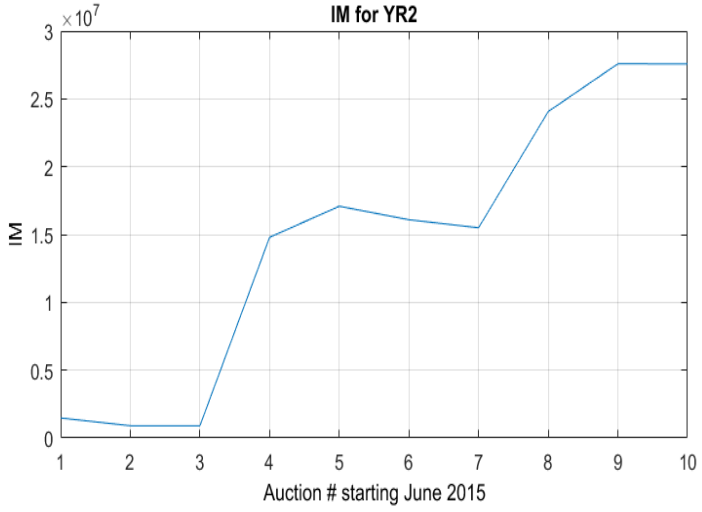
Back-Testing

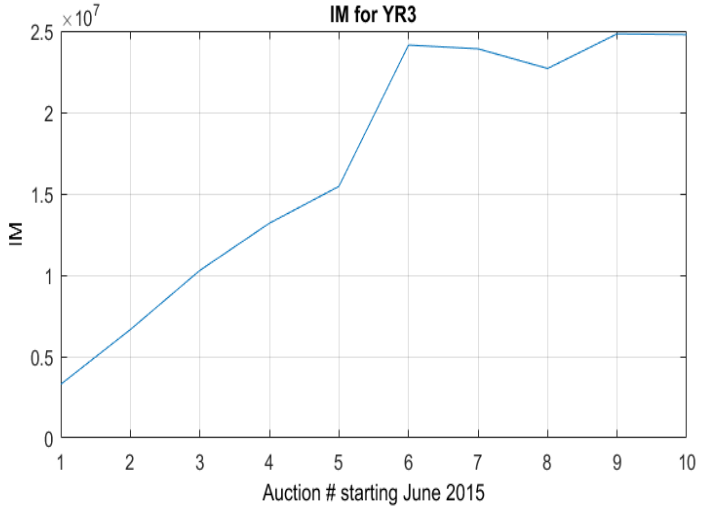
- ***Const*** = 100%

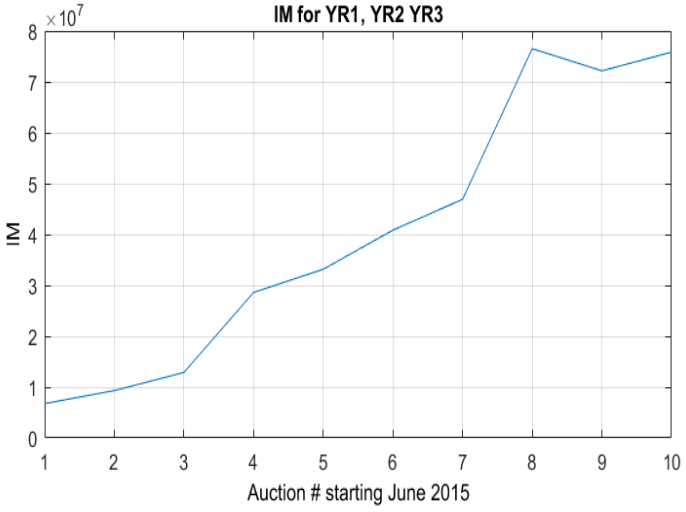
MPOR	inPromptNum	numFails/numScenarios
2	2	0.0226
2	3	0.0130
2	4	0.0106
2	5	0.0085
2	6	0.0073
2	7	0.0065
3	3	0.0106
3	4	0.0113
3	5	0.0103
3	6	0.0096
3	7	0.0090

GreenHat Portfolio: IM for LT portfolio for auctions starting June 2015









Discussion

- The concepts underlying the approach are common and preferred by regulators and market governing bodies. See, for example, Standard Initial Margin Model for Non-cleared Derivatives, ISDA, 2013
- Although called Historical Simulations, the method uses historical data only to determine the distribution around the forward prices and *not* the forward prices themselves. The forward prices, which at any auction reflect participants' expectations of future settled FTR prices, are determined at the auction time and, ideally, incorporate all information participants have about the future, including topology changes, outages, fuel prices, etc.
- Changes in participants' expectations result in changes in auction prices, changes in Mark-to-Auction portfolio values, and, finally, changes in VM which is levied to protect CCP against adverse movements of portfolio values.
- Initial Margin provides an additional protection against participant's default.

Discussion

- IM is computed after we construct distributions of potential movements of all forward contract prices over relatively short period of time, MPOR. These distributions are constructed using historical price movements.
- **Summary.** VM is needed to neutralize portfolio losses due to changes in forward expectations, while IM is needed to protect (with a high degree of confidence) against losses during the period of liquidation caused by default. Calculation of IM never requires predicting of forward prices.
- Key benefit of HS approach – it produces a joint distribution of price movements without requiring correlation or covariance inputs.

Discussion

- More work required:
  - *Adjustment for liquidity.* More analysis is needed to determine how adjust IM in case of illiquid paths.
  - *Choice of MPOR and other parameters for IM calculation.* We need to do more back testing of different portfolios to establish a definitive choice of these parameters.

POC: Historical Simulation Method

- At the initial stage HS has proved to be a reasonable methodology to be considered for computing IM.
- HS can also be a simple and reliable back-up method in production or for testing purposes.
- HS can also be used to improve effectiveness of other methodologies, such as Monte Carlo simulations, resulting is some kind of hybrid method.

Exhibit C

Document Accession #: 20211221-5202 Filed Date: 12/21/2021

Initial Margin and FTR Credit Requirements

Alex Eydeland
Bridgid Cummings
Financial Risk Mitigation Senior Task Force
September 29, 2020

Agenda

- Previously we reviewed initial backtesting results
- Today we will be covering
  - Additional Backtesting Results
  - Initial Margin Proposal
  - Considerations for FTR Credit Requirements

Additional Backtesting Results

Backtesting Process

Demonstrate that the IM methodology historically behaves as expected.

- Fix FTR portfolios at a particular time in the past, called the **measurement date**
- Calculate IM using historical data prior to the measurement date
- Calculate the actual move of the fixed portfolio over the time period equal to the liquidation period (i.e. 1 Auction Period, 2 Auction Periods, or to Settlement)
- Compare the actual move during the liquidation period with the computed IM
- Repeat this test for various measurement dates
- Compute the **failure rate** which is the percentage of times IM was less than an actual loss

Backtesting Objective

Verify that the failure rate is consistent with target risk percentile fixed in IM calculation methodology.

- Assuming a targeted 99% Confidence Interval, results expected to fall within a 1% failure rate.
- Expected results:
  - Failure rates will fall between 0.5% and 1.5%, whereby
    - ~ 0.5% implies more conservative IM estimations, and
    - ~1.5% implies less conservative estimations

Backtesting Results

Previously, two approaches to aggregate the Monthly IM values into the BOPP IM were discussed.

Liquidation Period	Failure Rate Sum of monthly IM	Failure Rate Square root sum of squares
To Settlement	0.37%	2.79%
1	0.31%	1.78%
2	0.28%	1.86%

The summation approach is a more conservative approach to the calculation in that the value is less than the expected 1% and the square root sum of squares is the less conservative approach since it is greater than the expected 1%. Both aggregation methods result in failure rates outside of the failure rate boundaries of 0.5% and 1.5%.

Backtesting Results

Utilize a blended approach to aggregate the Monthly IM values into the BOPP IM

$$IM_{Balance\ of\ PP} = .1 \cdot \sum IM_{Monthly} + .9 \cdot \sqrt{\sum IM^2_{Monthly}}$$

- This “blending” formula is designed to bring the backtesting results into the desired range.
- The choice of coefficients is driven by the goal to have as small a perturbation of square root sum of squares formula (case of non-correlated moves) as possible, but not smaller.

Liquidation Period	Failure Rate
To Settlement	1.24%
1	0.74%
2	0.65%

Backtesting Metric

In case of a failure, what is the average loss above the IM

- The **expected shortfall** indicates the percentage difference between the IM and the loss above the IM when there was a failure

IM Range (million USD)	Liquidation Period = "to settle" Shortfall (% of IM)	Liquidation Period = 1 Shortfall (% of IM)	Liquidation Period = 2 Shortfall (% of IM)
0-1	150	49	52
1-3	23	26	43
3-10	22	49	13
10 and above	36	40	37

Distribution of failures among participants

- There is no concentration of failures within a particular subset of participants
- When failures occur, no single participant stands out and failures are evenly distributed
  - Participants with 1-2 “fails” are the biggest subset of the total number of failing participants.
- The failures are not clustered within a small group of participants

Conclusion

- The historical back testing has demonstrated that the methodology proposed for computing IM has been performing as expected and is in agreement with the underlying assumptions.
- The methodology passes the back test for every choice of the liquidation period.
- Backtesting showed that the methodology does not underestimate the IM.
- It also showed that it does not overestimate the IM. Lowering the IM by 10% increases the failure rate by ~50%, bringing it out of targeted range.

Proposal for Initial Margin

The choice of liquidation period

- Our proposal is to choose **liquidation period = 2** as the input into the IM calculation procedure.
  - We need one period to detect a default and at least one period to take the liquidation measures.
  - Back testing for liquidation period = 2 showed good results for the failure rate, expected shortfall and failure distribution by participants.
  - A liquidation period of 2 aligns with the liquidation process to unwind a portfolio in a prudent manner

Considerations for FTR Credit Requirements

Current FTR Credit Requirements

Discussion of Components

- Path Specific Requirement
  - Replace with Initial Margin Methodology, using a Liquidation Period=2
  - Captures exposure of portfolio using best practices
- Undiversified Adder
  - Remove from the calculation
  - Not correlated to risk
- Per-MWh
  - Continue to consider as part of calculation, if works with summation methodology
  - Can serve to maintain a minimum requirement

Discussion of ARR Credits

- ARR Credits
  - Used as an offset to FTR Credit Requirements
  - Assumed to be guaranteed revenue

Period	Monthly Requirement	ARR Credits	Net of ARR Credits and Monthly Requirement	Final Monthly Requirement
SEP 2020	$464,200	$637,106	-$172,906	$0
OCT 2020	$639,571	$657,232	-$17,661	$0
….	…	…	…	…
APR 2020	$409,637	$636,859	-$227,222	$0
MAY 2020	$711,428	$658,397	$53,031	$53,031

Discussion of ARR Credits

- Final settlement of ARRs are reassigned on a daily basis
  - Based on a proportional basis within a zone, as load shifts from one LSE to another within a transmission zone (PJM Manual 6, Section 4.6)
- At the time of default, load served by the defaulting party is shifted to the EDC pursuant to the provisions of the Tariff, section 7.3 and OA, section 15.1.5.

Discussion of ARR Credits

- Given this load shift, the ARRs are also reassigned
- After the default, these ARR revenues will no longer be available in the defaulting party's invoice to offset the potential charges of unwinding the portfolio
- Considering ARR credits to be available at the time of default is counter to the settlement process following a default

Should ARR credits be considered as part of an offset to the collateral requirements

Discussion of Realized Gains and Losses

- Realized Gains and Losses
  - The gains or losses are a result of selling FTR(s) in an auction
    - Does not include bilateral transactions
  - At time of settlement, the gains will be considered a payment and the losses will be a charge to the participant
  - Recognizing these in the collateral requirements is in line with the actual settlement of these types of FTR transactions

Recognizing these in the collateral requirements is in line with the actual settlement of these types of FTR transactions

Discussion of Mark to Auction

- Mark to Auction
  - The calculation will remain as the difference between the original cleared price and most recent auction price multiplied by the MW quantity
  - However, it will be updated to determine MTA based on remaining open positions (i.e. will no longer include realized gains and losses)
  - Today, the MTA is only utilized if the most recent auction prices are indicating a portfolio experiencing a loss, the amount of which is added to the base margin

Net MTA appropriately on both sides, in line with best practices

Next Steps

- Finalize approach to calculating a Total Credit Requirement for FTR positions
- Quantify impacts to Member Portfolios

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

	)	
PJM Interconnection, L.L.C.	)	Docket No. ER22-___-000
	)	

VERIFICATION

Pursuant to 28 U.S.C. § 1746 (2000), I state under penalty of perjury that I am the Dr. Alex Eydeland referred to in the foregoing "Affidavit of Dr. Alex Eydeland on Behalf of PJM Interconnection, L.L.C.," that I have read the same and am familiar with the contents thereof, and that the facts set forth therein are true and correct to the best of my knowledge, information, and belief.

Executed this 21 day of December, 2021.

ALEX EYDELAND