SECURITIES DIVISION

Uplifts and Imperfect Hedges

FERC Technical Workshop on Price Formation and Uplift Payments

Harry Singh

J Aron and Company

Sept 8, 2014

Role of Financial Participants

- Creditworthy counterparty
  - Facilitating markets for long term contracts
  - Supporting liquidity
  - Making physical and financial markets
  - Financing/Lending alongside hedging

- Examples of Hedging Products
  - Tolling Arrangements
  - Heat Rate Call Options
  - Revenue Puts
  - Swaps (Heat Rate, Fixed Price, Basis)

What are Uplifts?

- Uplift payments or uplift credits are “make-whole” made to generators to compensate for costs not reflected in Locational Marginal Prices (LMPs) and allocated to other market participants as “uplift charges”. Examples include:
  - Start-up/min-load cost recovery, units at minimum output ineligible to set LMP, out-of-market commitments/dispatch, units committed for reliability, lost opportunity cost, payments to cover costs in excess of offer-caps
- Uplifts can also be generated by demand response payments (e.g. LMP payments under FERC Order 745)
  - Uplift is independent of whether dispatched demand response resource sets price
- Real-time congestion uplift (negative balancing congestion)
  - A revenue shortfall (or uplift charge) created by deviations in schedules between day-ahead (DA) and real-time (RT) markets when **RT transmission capacity < DA transmission capacity**
  - Cost allocation can vary depending on the market, e.g., can be allocated to load serving entities (LSEs) (CAISO), transmission owners (NYISO) or FTR holders (PJM)
  - Has been a significant issue in CAISO and PJM with a significant proportion of deviations corresponding to virtual transactions
  - Efforts to address other uplifts in PJM (e.g. through closed loop interfaces) have at times made this one worse

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Why are uplifts a concern for market participants?

- Uplifts are difficult to hedge
  - Generators and loads can hedge themselves from volatility of LMPs using a range of forward contracting arrangements but cannot hedge exposure to uplift payments or uplift charges
- Distortion of price signals
- Allocation of some uplifts such as negative balancing congestion in PJM has significantly reduced hedge effectiveness of FTRs

Basis Risk and Impacts of Imperfect Basis Hedges

- Example 1 – A generator has hedged its output using a forward contract indexed to LMPs at a nearby trading hub. The generator is exposed to congestion risk between its busbar and the hub and intends to hedge this using an FTR. If an ex-post uplift allocation reduces the hedge effectiveness of the FTR, the generator is left unhedged on its busbar to hub congestion exposure.
- Example 2 – An LSE has arranged a forward contract at the PJM West Hub to help insulate its customers from volatility in LMPs. The LSE is using FTRs to hedge its load zone to hub congestion exposure. Any uplift allocation that reduces the hedge effectiveness of the FTR leaves the LSE exposed to congestion risk.
- Example 3 – A financial entity writes a basis swap for the above generator and LSE to hedge their congestion risk and then uses FTRs to hedge the congestion risk it has acquired. An underfunded FTR results in unhedged risk.

Some Recent Examples of Uplifts

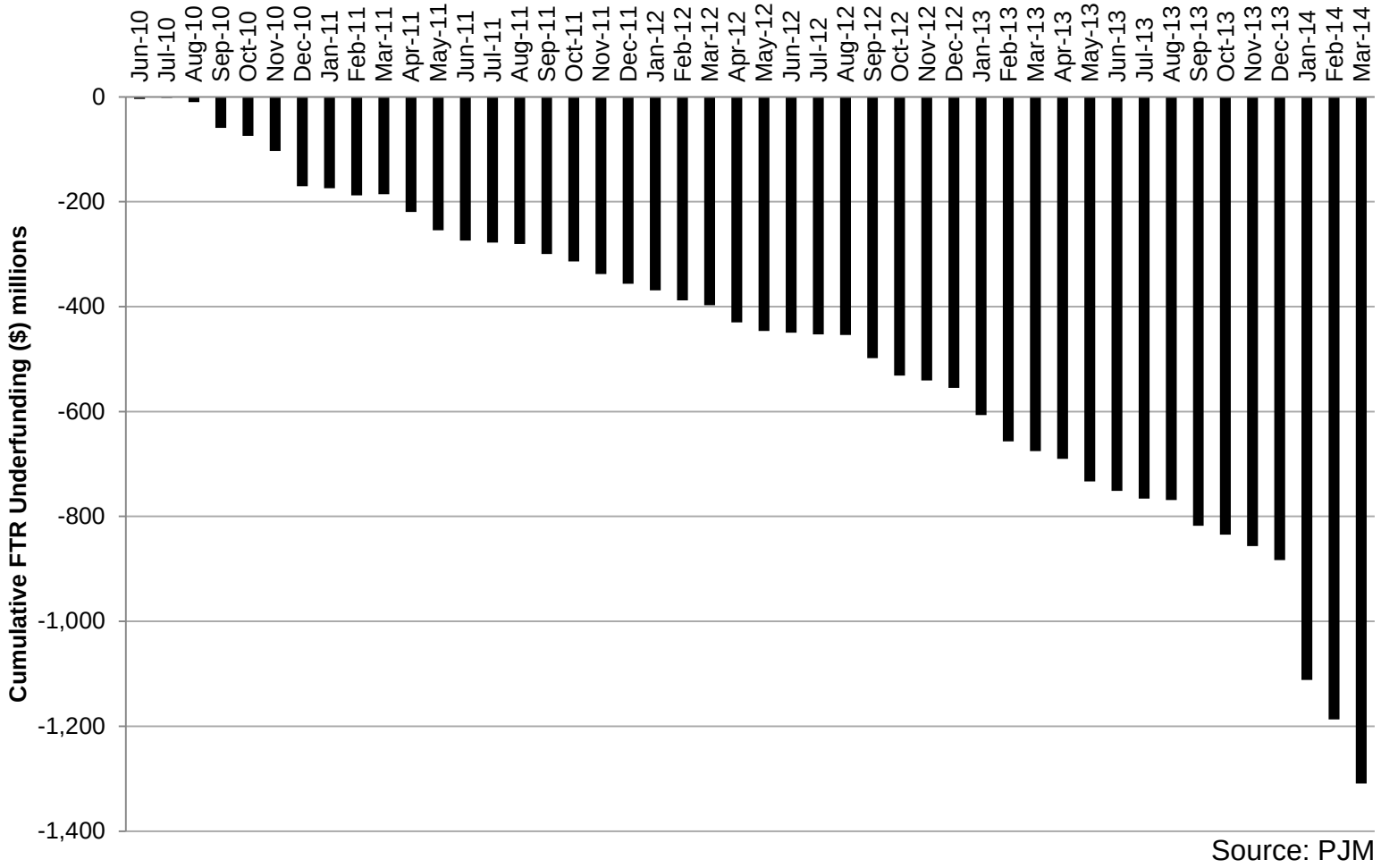
- Polar Vortex/High Gas Prices - in PJM, uplift charges reached significant levels in January 2014 (~$555 million for Balancing Operating Reserves (BOR) and Lost Opportunity Costs (LOC))

	Jan - Mar 2013	Jan - Mar 2014	Change	% Change
Total Energy Uplift Charges	$ 264,450,578	$ 737,090,222	$ 472,639,644	178.7
Enerrgy Uplift as a percentage of Total PJM Billing	3.40%	3.50%	0.10%	2.7

- Hot Weather Operations (Sept 10-11, 2013) - $23 million of real-time congestion uplift (negative balancing congestion) in just 11 hours in PJM's ATSI zone
- Cumulative PJM FTR underfunding has exceeded $1.4 billion since June 2010
- CAISO Real-Time revenue imbalance ~$235 million in 2012

Source: PJM, Monitoring Analytics PJM 2014 Quarterly State of the Market Report Jan – Mar
Real-time Revenue Imbalance in CAISO Markets, Ryan Kurlinski, Apr 24, 2013
http://www.caiso.com/documents/discussionpaper-real-timerevenueimbalance_californiaiso_markets.pdf

Cumulative FTR Infeasibility in PJM

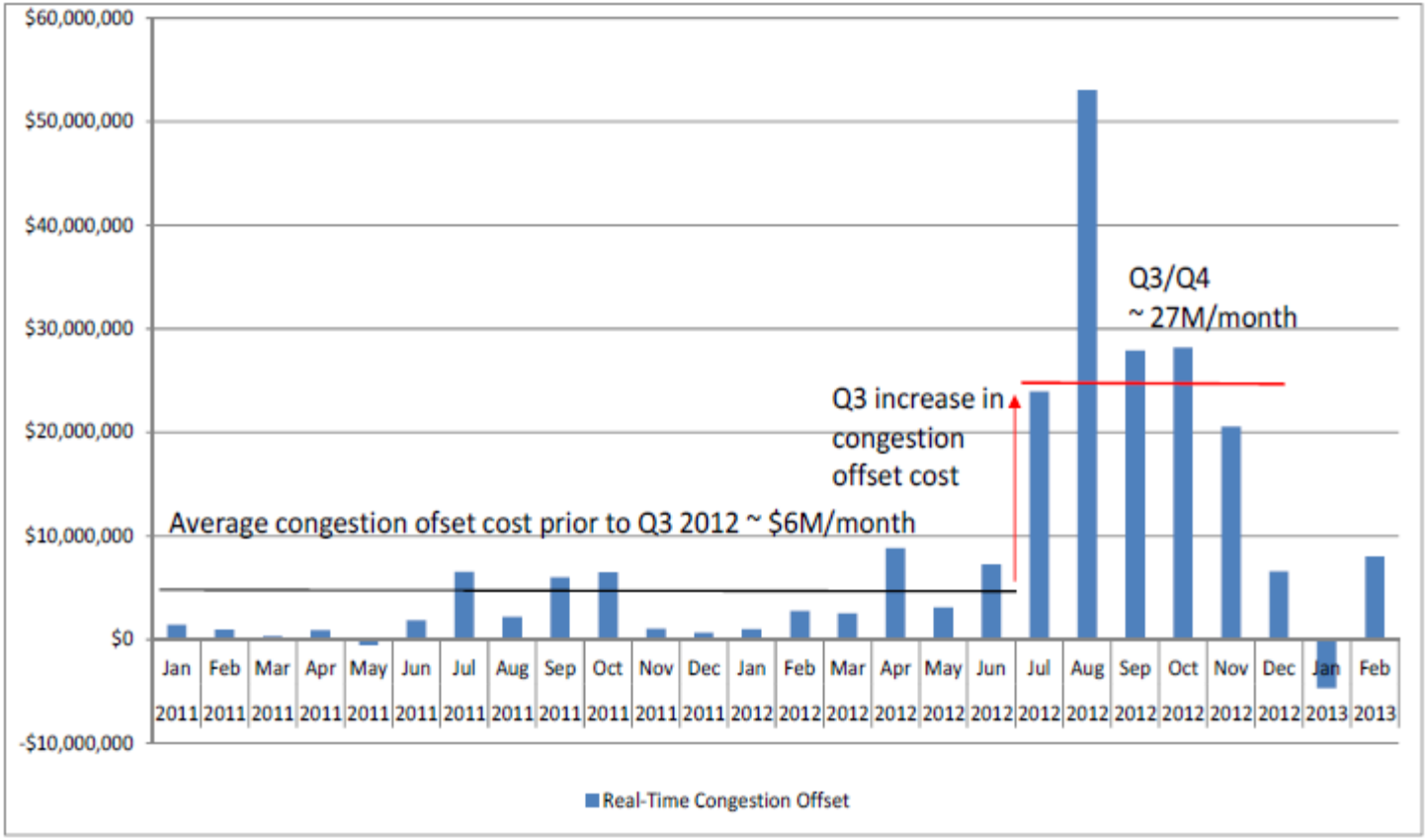


Source: PJM

- FTR defaults in PJM in 2007-08 were ~$85 million and resulted in reforms under Order 741
- FTR underfunding adds risk to the market but has not received the same attention

CAISO's Real-Time Congestion Offset Charge

- Equivalent to PJM's negative balancing congestion but is allocated differently - does not compromise hedge effectiveness of CAISO Congestion Revenue Rights (CRRs)
- Less formal governance in CAISO can result in faster resolution of problems



Source: CAISO FERC Filing in ER13-1060, March 8, 2013
http://www.caiso.com/Documents/Mar8_2013-TariffAmendment-TransmissionConstraintRelaxationER13-1060-000.pdf

Recent Efforts to Address Uplifts


- Modeling Additional Reserves (PJM)
  - Intended to reflect in LMPs commitment actions taken across PJM or in large zones
  - PJM has proposed to increase real-time reserves from 1300 MW to 2600 MW and day-ahead reserves by 3 percent during hot/cold weather alerts to reflect in LMPs the additional reserves already committed by PJM operators
- Closed loop interfaces (PJM)
  - Intended to reflect in LMPs, commitment and dispatch actions taken in local areas (e.g. ATSI closed loop interface)
- "Extended" LMP or Convex Hull Pricing (MISO)
  - Reflects commitment and dispatch decisions
- Enhanced Contingency Modeling (CAISO)
  - Introduces a capacity component to LMPs to incorporate units currently committed under the Minimum Online Capacity (MOC) constraint

PJM's proposal for modeling additional reserves is available at
http://www.pjm.com/~/media/committees-groups/committees/mrc/20140529/20140529-item-05-erpiv-update-presentation.ashx
PJM's perfect dispatch initiative: http://www.pjm.com/~/media/about-pjm/newsroom/fact-sheets/perfect-dispatch-fact-sheet.ashx
CAISO Contingency Modeling Enhancement proposal http://www.caiso.com/documents/issuepaper-contingecymodelingenhancements.pdf

Efforts to Address Uplifts - Closed Loop Interfaces
May sometimes just shift costs to a different Uplift


- **Example of a Closed Loop Interface - The ATSI Interface in PJM (application of the interface on Sept 10-11, 2013 created ~23 million of negative balancing congestion)**

  "PJM will be pricing for a new ATSI interface starting on July 17, 2013. PJM does not anticipate the new ATSI interface to be used except during the hottest days in the summer.

  The new ATSI interface will only be used to set LMP when emergency mandatory load management is issued in the ATSI transmission zone. This interface is not a reactive or IROL transfer interface, nor is it an interface that is monitored by PJM operations.

  The new ATSI interface is a closed-circle interface and is comprised of all tie lines into the ATSI transmission zone."

- A "closed loop interface" involves limiting the flow on tie lines into an area below a limit where the limit can be "dialed in" to congest the interface – this helps internal resources that may be dispatched for various reliability reasons to set price within the region of the interface which in turn helps price formation and reduction of make-whole uplifts but at the cost of creating negative balancing congestion – the dynamic nature of the limit makes it difficult to model in advance

- Application of close loop interfaces for price formation purposes can be unrelated to actual transmission scarcity and should not be used to shift uplifts

Source: PJM ATSI Interface http://www.pjm.com/~/media/etools/oasis/system-information/atsi-interface-definition-update.ashx

Some Contributors – Infeasible ARR Allocations

- ARRs are a right of first refusal for FTRs awarded to LSEs
- Infeasible ARRs are based on a historical requirement related to FERC's Long term FTR Rule (Order 681) – awards rights that exceed the physical capacity of the transmission system
- Conflicts with CFTC RTO Exemption Order that conditions exemption of FTRs from CFTC jurisdiction only if the quantity of FTRs is limited by the physical capacity of the transmission system (Final Order in Response to a Petition to Exempt Specified Transactions Authorized by a Tariff or Protocol, 19 Fed. Reg. 19,880, 19,913 (Apr. 2, 2013))

2013-14

Source	Sink	MW
6BYRON25KVBY-1	COMED	1,070
6BYRON25KVBY-2	COMED	1,041
4QUADC18KVQC-1	COMED	576
4QUADC18KVQC-2	COMED	576
MISO	AEPW.O.MONPOWER	535
MISO	APS	420
952ROCK16KVRO11	COMED	133
952ROCK16KVRO12	COMED	133
NILLINOISHUB	COOK	78
HOPECREE25KVUNIT1	PSEG	76
937LEE13.5KVLEE33-1	COMED	71
937LEE13.5KVLEE33-2	COMED	71
937LEE13.5KVLEE31-1	COMED	71
937LEE13.5KVLEE31-2	COMED	71
MISO	DAY	70
EDGEMOOR23KVUNIT05	DPL_ODEC	68
21KINCA20KVKN-1	COMED	55
21KINCA20KVKN-2	COMED	55
194SABR138KVTR7112	COMED	54
MISO	DUKEXP	54

2014-15

Source	Sink	MW
ROCKPOR226KVRP1	AEPW.O.MONPOWER	347.5
ROCKPOR226KVRP2	AEPW.O.MONPOWER	347.5
WALDWICKJK	HUDSON-LINDENABC	238.9
NILLINOISHUB	COOK	200
MISO	APS	139.1
MISO	AEPW.O.MONPOWER	117.6
6BYRON25KVBY-1	COMED	104.7
6BYRON25KVBY-2	COMED	101.9
HARRAPS20KVGEN3	APS	89.5
HARRAPS20KVGEN2	APS	88.2
HARRAPS20KVGEN1	APS	88
21KINCA20KVKN-1	COMED	82.2
21KINCA20KVKN-1	COMED	82.2
4QUADC18KVQC-1	COMED	77.4
4QUADC18KVQC-1	COMED	77.4
FTMARTIN22KVGEN2	APS	70.2
FTMARTIN22KVGEN1	APS	69.6
HATFIELD18KVGEN1	APS	68.2
HOMERCIT24KVUNIT3	PENELEC	64.2
HOMERCIT20KVUNIT1	PENELEC	63.2

Source: PJM 2013/14 and 2014/15 Stage 1A Over allocation notices
http://www.pjm.com/~/media/markets-ops/ftr/annual-arr-allocation/2013-2014/2013-2014-annual-arr-stage-1a-over-allocation-notice.ashx
http://www.pjm.com/~/media/markets-ops/ftr/annual-arr-allocation/2014-2015/2014-2015-annual-arr-stage-1a-over-allocation-notice.ashx

CFTC Requirements for FTRs

*An ``FTR'' was proposed to be defined as ``a transaction, however named, that **entitles one party to receive, and obligates another party to pay**, **an amount based solely on the difference between the price for electricity**, established on an electricity market administered by a Requesting Party **at a specified source** (i.e., where electricity is deemed injected into the grid of a Requesting Party) **and a specified sink** (i.e., where electricity is deemed withdrawn from the grid of a Requesting Party)." As set forth in the Proposed Order, **FTRs would be exempt only where each FTR is linked to, and the aggregate volume of FTRs for any period of time is limited by, the physical capability (after accounting for counterflow) of the electric energy transmission system** operated by the Requesting Party offering the contract for such period; a Requesting Party serves as the market administrator for the market on which the FTR is transacted; each party to the FTR is a member of a particular Requesting Party (or is the Requesting Party itself); the FTR is executed on a market administered by that Requesting Party; and the FTR does not require any party to make or take physical delivery of electric energy.*

The Commission's Final Order does not impose position limits on the Covered Transactions. The Commission accepts the Requesting Parties' representations that the physical capability of their transmission grids limits the size of positions that any single market participant can take at a given time. Moreover, based upon the representations made in the Petition, the Proposed Order provided that each category of exempted transaction, including FTRs, would be limited by the physical capability of the electric energy transmission system. Accordingly, as the Final Order continues to limit each Covered Transaction category to the physical capability of the transmission grid, the Commission believes that imposing position limits on the Covered Transactions is not necessary at this time in order to make the requisite public interest and purposes of the CEA determinations.

Final Order in Response to a Petition to Exempt Specified Transactions Authorized by a Tariff or Protocol, 19 Fed. Reg. 19,880, 19,913 (Apr. 2, 2013)
http://www.cftc.gov/LawRegulation/FederalRegister/FinalRules/2013-07634

Impacts - PJM FTRs no longer as useful as congestion hedges

PJM FTRs no longer as useful to hedge congestion

- Declining percentage of ARR conversion to FTRs by Load Serving Entities (LSEs)
- Underfunding (or hedge effectiveness) can vary significantly by hour and day

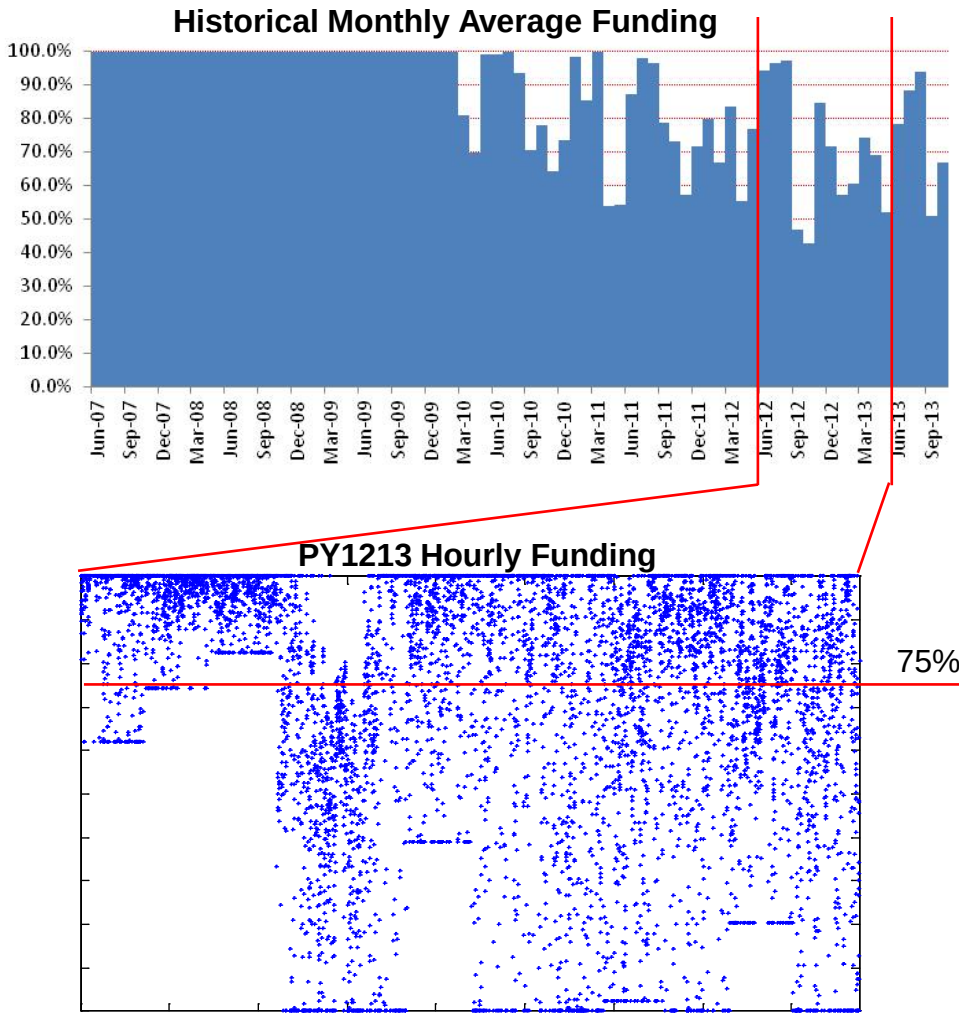
Aggregate measures of hedge effectiveness can be misleading

- "ARRs served as an effective offset against congestion. The total revenues received by ARR holders, including self-scheduled FTRs, offset 100 percent of the total congestion costs experienced by these ARR holders in the Day-Ahead Energy Market and the balancing energy market for the first ten months of the 2013 to 2014 planning period and for the 2012 to 2013 planning period." (Q1 2014 PJM State of the Market Report – Monitoring Analytics p 407-408 http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2014/2014q1-som-pjm-sec13.pdf)

Planning Period	Self-Scheduled FTRs (MW)	Maximum Possible Self-Scheduled FTRs (MW)	Percent of ARRs Self-Scheduled as FTRs
2009/10	68,589	109,612	62.6%
2010/11	55,732	102,046	54.6%
2011/12	46,017	103,735	44.4%
2012/13	41,716	99,115	42.1%
2013/14	29,341	94,061	31.2%

Source: Monitoring Analytics 2013 Annual State of the Market Report Discussion on Mar 27, 2014 (Table 13-10 on p 102)
http://www.pjm.com/~/media/committees-groups/committees/mmuac/20140327/2013-state-of-the-market-report-for-pjm-review.ashx

Hedge effectiveness of PJM FTRs can be unpredictable



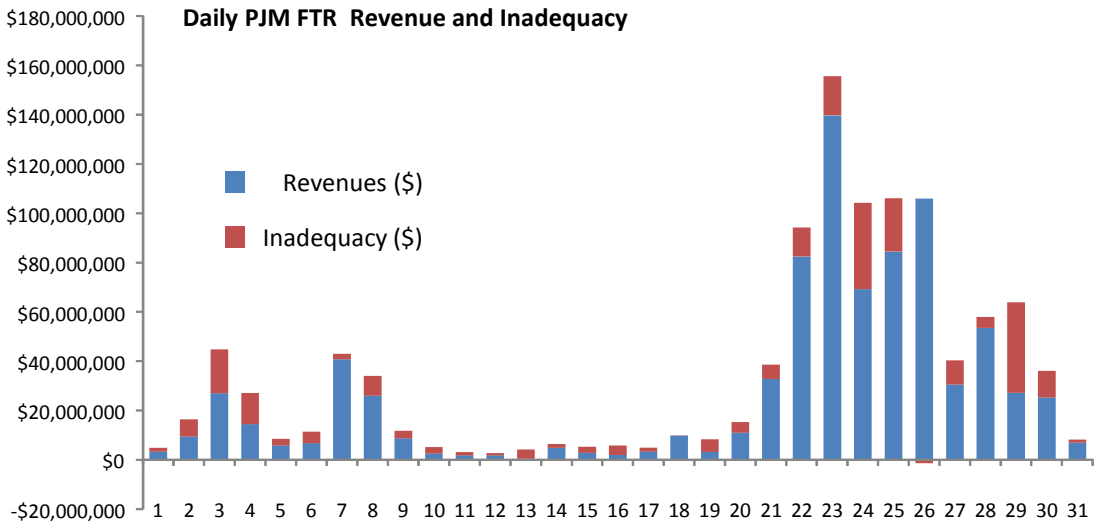
FTR funding (i.e. hedge effectiveness) can vary significantly from the average funding level

This makes it difficult to restore hedge effectiveness of FTRs by simply purchasing additional FTRs should they be available

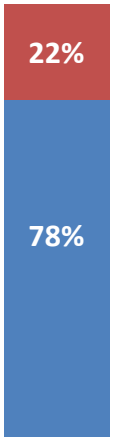
Example FTR funding Feb 14, 2014 = 30 percent, Sept 10-11, 2013 = 0 percent

Source: PJM, J Aron

January 2014 FTR Performance

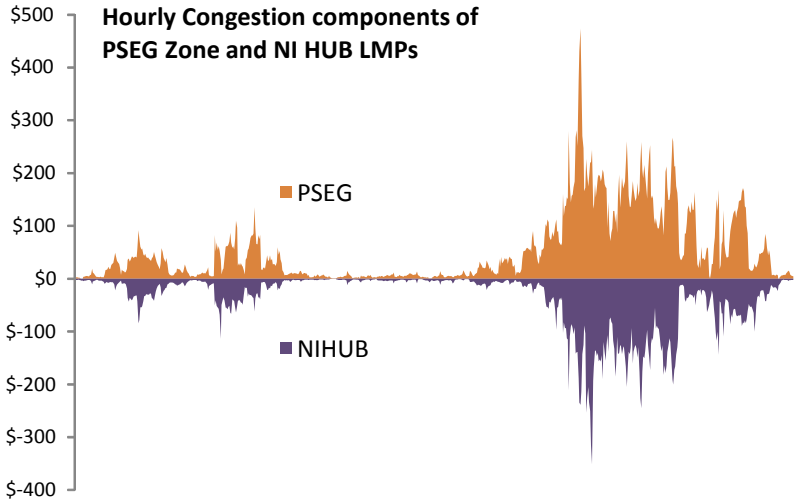


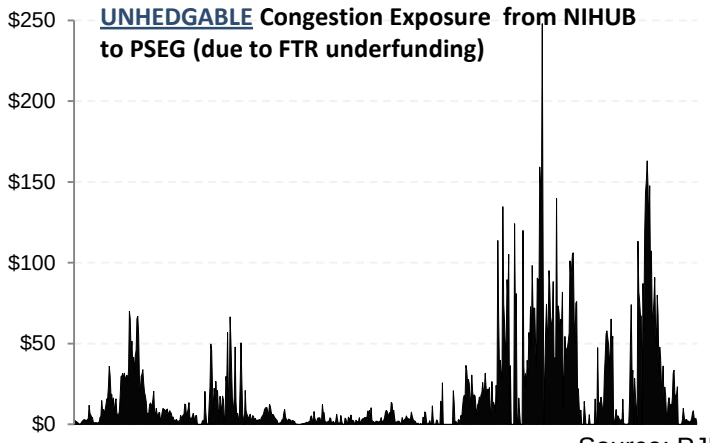
Total target :
$1,081.6 mm



Total Inadequacy :
$238.9 mm

Total Credit :
$842.7 mm





Source: PJM, J. Aron

Hedging vs Speculation – Different Impacts of FTR Underfunding

- Use of FTRs as congestion hedges is intended to insulate the FTR holder from market price movements – this involves using the FTR to offset congestion exposure on an underlying basis position e.g. an LSE's congestion exposure from a Load zone to Hub or Resource location, Generator's congestion exposure from its node to a Hub or a financial intermediary's to congestion through a basis swap it has sold
- The use of FTRs as hedges is intended to be risk reducing – with the FTR offsetting the underlying basis position, the holder is no longer exposed to actual LMPs
- An underfunded FTR fails to serve this purpose and adds risk regardless of the fact that the underfunded FTR may have been available at a lower price – consequently FTR underfunding cannot be adequately addressed by the market paying less for FTRs
- Use of FTRs as speculative instruments involves taking on risk – underfunded FTRs may not pose the same challenges for such activity

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What is the Purpose of FTRs?

- Distribution of total congestion revenue including any real-time shortfalls?
  - PJM FTRs do accomplish this
- Congestion hedges (financial equivalent of firm transmission service)?
  - PJM FTRs do not accomplish this objective due to underfunding[1]
  - The PJM Independent Market Monitor (IMM) has stated that creation of ARRs in the PJM market terminated the right of FTR holders to firm transmission service and that ARR allocation now provides the financial equivalent of physically firm transmission service[2]
  - However, ARRs are an ineffective hedge when actual system conditions differ from expectations in FTR auctions, or if prices in FTR auctions decline in response to underfunding, or if allocated ARRs do not match actual source-sink combinations
  - For example, ARR payouts for Stage 1A infeasible ARRs in 2013-14 were ~$103 million, while the actual day-ahead congestion corresponding to these ARRs was ~$201 million, i.e., ARR revenues can significantly differ from the congestion that they are intending to hedge [3]
- An instrument to speculate on real-time congestion uplift
  - FTR prices have declined in response to underfunding[4]
- A price signal for transmission
  - PJM FTRs do not accomplish this (e.g., zero percent funding on Sept 10-11, 2013)

[1] For a discussion of proper accounting for FTRs in a multi-settlement system, see Financial Transmission Right, Revenue Adequacy and and Multi-Settlement Systems, William W. Hogan, March 18, 2013 http://www.hks.harvard.edu/fs/whogan/Hogan_FTR_Rev_Adequacy_031813.pdf

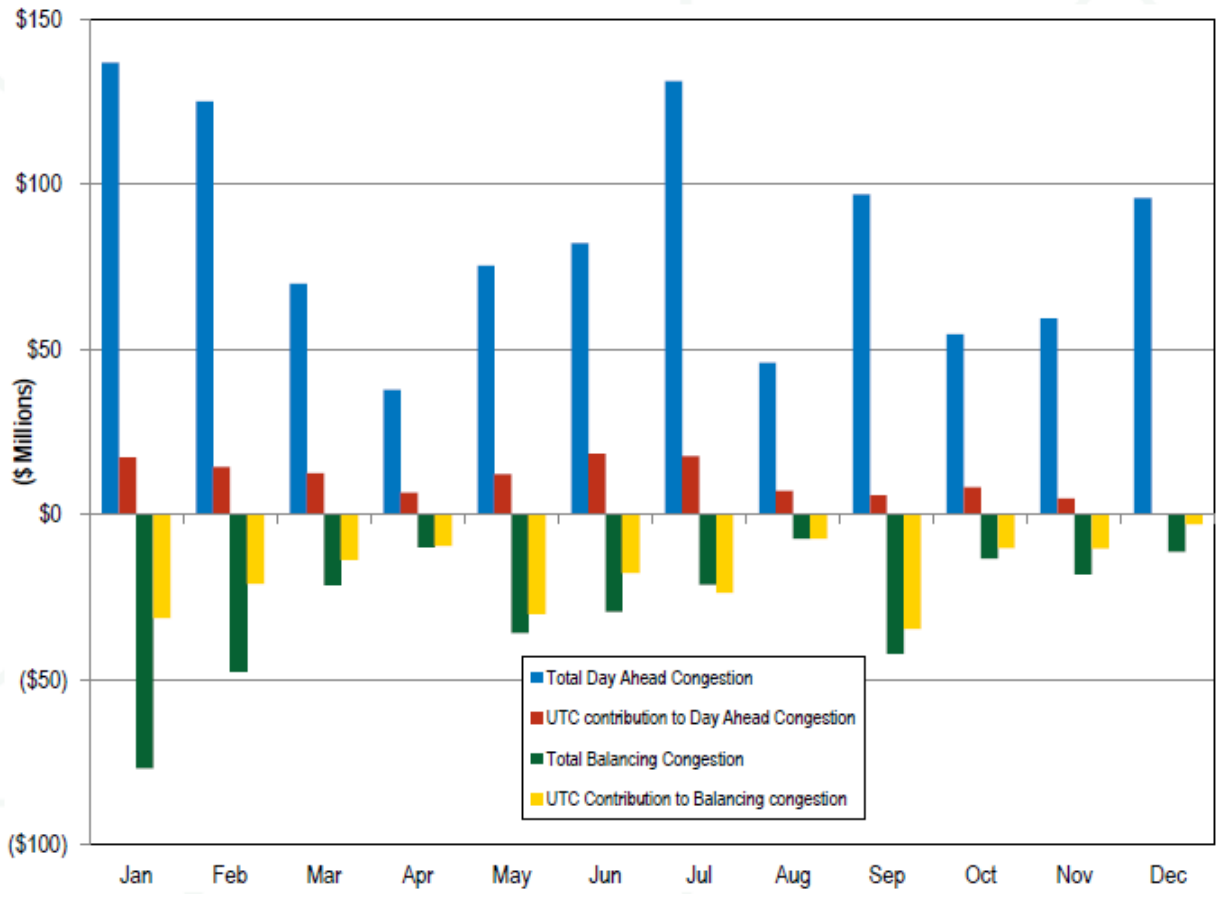
[2, 4] 2014 PJM Quarterly State of the Market Report – Section 13, page 378
http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2014/2014q1-som-pjm-sec13.pdf

[3] Source: PJM 2013/14 Stage 1A Over allocation notice
http://www.pjm.com/~/media/markets-ops/ftr/annual-arr-allocation/2013-2014/2013-2014-annual-arr-stage-1a-over-allocation-notice.ashx

Virtual Transactions and Uplift Allocation

- Virtual Transactions – One characteristic of virtual transactions is that they (by definition) involve deviations between DA and RT schedules which can make them a candidate for allocation of uplifts attributable to deviations
- An example of uplift charges attributable to virtual supply offers (INCs) is make whole payments associated with reliability commitment protocols (with the assumption that net virtual supply can impact such commitments). However, the details and levels for such allocations can vary widely among different markets
- UTC transactions (up to congestion transactions involve a matching INC and DEC at two different locations and serve as spread bids between the real-time and day-ahead markets – while INC and DEC bids are allocated reliability commitment charges, UTCs are currently not allocated similar charges)
  - Should UTC transactions pay a share reliability commitment charges?
  - In an uncongested system, a matching INC and DEC should offset without any impact such charges
  - In a congested system, a matching INC and DEC pair in different locations can have an impact on such charges – the actual impacts may be an empirical question
- Impact of UTCs on real-time congestion uplift and FTR underfunding
  - If RT transmission < DA transmission (i.e., a model mismatch exists between RT and DA markets), any deviation can contribute to negative balancing congestion
  - UTC and other virtual transactions may have constituted a large majority of deviations corresponding to negative balancing congestion in PJM in 2013

What is the Impact of Virtual Transactions and UTCs on Negative Balancing Congestion in PJM?



Source: FTRSTF Education, Monitoring Analytics, June 25, 2014 Slide 8
http://www.pjm.com/~/media/committees-groups/task-forces/ftrstf/20140625/20140625-ma-education-session.ashx

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