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# **Market Liquidity Means, Ends & Myths**

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# Discussion Topics

- Myth 1: Nodal markets are inherently less liquid (as compared to zonal / bi-lateral markets)
- Myth 2: Banks have virtually in-exhaustible access to capital at low cost (pre-2008 perception)
- Myth 3: Liquidity from hedge funds and exchange clearing can entirely replace the banks' role in the power market
  - Power market liquidity from banks has decreased since 2008 due to the financial crisis
  - Exchange clearing and hedge funds, IPPs or other alternative players have filled the gap, particularly on short term liquidity. Volcker rule may hasten this
  - Will the role of banks change with respect to longer term liquidity and lending?
- Myth 4: Bank "customer business" and proprietary trading are clearly distinguishable
- Myth 5: Power markets are "liquid" (i.e. Banks can do "customer business" in power without warehousing the financial risk)

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Disclaimer and disclosures;

- Views expressed here are my own and not those of my company
- I consider myself a pro-LMP, pro-competition protégé of Dr. Hogan (though Dr. Hogan may differ in this assessment)

# ENDS: The Function of Spot Markets

- A spot market in electricity has two principal functions:
  - **Maintain Efficient Short-Term Operations and Dispatch** – Least-cost and reliable dispatch to meet load given available resources in the hour/day; efficient usage of transmission capacity; largely independent of longer-term contract arrangements.
  - **Facilitate Longer-Term Contracting and Competitive Entry** – Spot market reduces the risks of contracting; Allows contracting parties to sell “overs and unders” to meet their obligations at least cost/highest profits, facilitates entry by undiversified competitors, each of which can compete in the specific activity it does best without needing to be a self-contained, full-service producer; sends price signals regarding when and where new generation or transmission is needed.
- Market design needs to get the first one right, not only in terms of efficient, least-cost dispatch and transmission usage, but also in creating the right signals to support the second function
- A spot market should allow market forces to determine the amount, mix and cost characteristics of generating plants, and the level and shape of demand, **in the long run**. This is where the largest benefits can be expected from a well-designed competitive market.

# Does LMP Design Sacrifice Liquidity?

- Trade volume on ICE for February 2012 in US markets shown in the table at right:
  - PJM LMP market is most liquid
  - Some “LMP” markets are not that liquid
  - Mid – C bilateral market is quite liquid
  - Many bilateral markets are very illiquid
- “Liquidity” definitions relative – i.e. equities, other commodities, CDSs, etc. are lots more liquid

Reported ICE Trades During February 2012			
Row Labels	Sum of Total Volume Traded (MW)	Row Labels	Sum of Total Volume Traded (MWH)
<b>Bilateral</b>		<b>Bilateral</b>	
Alberta	1,635	Alberta	1,343,135
COB	11,400	COB	167,800
<b>Mid C</b>	<b>204,825</b>	<b>Mid C</b>	<b>39,631,400</b>
Ontario	650	Ontario	254,800
Palo	24,825	Palo	5,495,775
SOCO	800	SOCO	10,000
<b>LMP</b>		<b>LMP</b>	
CAISO NP 15	6,700	CAISO NP 15	2,412,600
CAISO SP15	237,763	CAISO SP15	57,883,990
ERCOT	269,061	ERCOT	14,254,286
MISO Illinois Hub	50	MISO Illinois Hub	400
MISO Indiana Hub	176,185	MISO Indiana Hub	16,124,320
MISO Minn Hub	200	MISO Minn Hub	3,200
Nepool MH	120,950	Nepool MH	14,073,000
NYISO A	13,700	NYISO A	3,693,750
NYISO G	8,700	NYISO G	1,489,950
NYISO J	1,500	NYISO J	570,850
PJM AD Hub	63,300	PJM AD Hub	16,258,800
PJM Eastern H	650	PJM Eastern H	217,850
PJM JCPL Zone	100	PJM JCPL Zone	438,000
PJM NI Hub	10,900	PJM NI Hub	9,317,250
PJM PSEG Zone	395	PJM PSEG Zone	850,610
<b>PJM WH</b>	<b>1,097,576</b>	<b>PJM WH</b>	<b>123,957,524</b>
<b>(blank)</b>		<b>(blank)</b>	
(blank)	43,696	(blank)	3,516,500
<b>Grand Total</b>	<b>2,295,561</b>	<b>Grand Total</b>	<b>311,965,790</b>

Regardless of market design, liquidity mainly driven by diverse ownership of generation and load serving obligations, and ready access to transmission

# Illiquid Bilateral Markets Likely Maintain Significant Inefficiencies

- UK Real Time spot market bid/offer spreads for 2/20/2012 are shown in the table at right:
  - Requirement for bilateral arrangements makes managing imbalances more difficult
  - Wide bid/offer spreads can be crushing for merchant generation or a transmission dependent LSE
  - Likely result is inefficient dispatch as integrated market participants rely on self-scheduling own resources rather than accessing market for covering “overs” and “unders”

February 20, 2012 PM RT Market in UK			
	"System Sell Price"	"System Buy Price"	Bid/Offer Spread
SP 25	41.0	41.0	0.0
SP 26	40.4	60.4	20.0
SP 27	38.8	40.0	1.2
SP 28	36.7	39.8	3.0
SP 29	32.5	39.9	7.4
SP 30	31.2	39.8	8.5
SP 31	34.4	48.7	14.3
SP 32	34.7	48.7	14.0
SP 33	34.8	48.5	13.7
SP 34	35.9	48.3	12.4
SP 35	37.9	49.6	11.7
SP 36	53.2	92.5	39.3
SP 37	54.4	102.6	48.2
SP 38	54.0	90.0	36.0
SP 39	36.6	50.6	14.0
SP 40	35.5	48.6	13.1
SP 41	37.0	46.5	9.5
SP 42	35.7	45.6	9.9
SP 43	34.7	42.8	8.2
SP 44	32.7	41.9	9.2
SP 45	34.3	39.9	5.6
SP 46	32.4	40.1	7.7
SP 47	34.7	35.7	1.0
SP 48	34.4	36.0	1.6
UK RT Balancing Market Managed by GB System Operator			

ISO markets provide low transaction cost access to the spot market, efficient dispatch and efficient use of transmission. Transparent, reliable spot pricing creates a straightforward index against which to settle futures and contracts for differences

# PJM West Hub Spot

## Very Liquid; Low Bid/Offer Spreads

inentalExchange™ (ICE) - aklein @ Edison Mission Marketing & Trading, Inc.

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Activate All **Live Only** Hold Bids Hold All Hold Offers Excel Ideas

als UDS Portfolio13 WSCC PJM\_BalDay oil Northeast NYISO NYoff OFF peak NOX PJM\_ECAR NY\_On PJM\_on PJM\_NYA PJM\_OFF\_ICEclear AEP\_Day\_on AD\_Hub\_NI\_Hub\_OP NYISO\_Short\_term PJM\_West\_spreads NI\_Hub

On Hit/Lift Hold Bids On Hit Hold Offers On Lift Re-Link Agents History Formulas

Product	Hub	Begin Date	End Date	Strip	+ -	Sell	Qty	Bid	Offer	Qty	Buy	Last	Kill	Qty	Bid	Offer	Qty	Kill	Pin	+ -
Peak	AD Hub Bal Day	2Mar12	2Mar12	HE 0800-HE 2300	+	Hit	50	31.75	32.65	50	Lift	31.30								+
Peak Spr	AD Hub Bal Day/Indiana Hub RT	2Mar12	2Mar12	HE 0800-HE 2300		Hit	50	2.50	7.00	50	Lift									
Peak Spr	AD Hub Bal Day/NI Hub Bal-Day	2Mar12	2Mar12	HE 0800-HE 2300		Hit	50	0.50	3.25	50	Lift									
Peak	Indiana Hub RT	2Mar12	2Mar12	HE 0800-HE 2300	+	Hit	50	25.75	26.75	50	Lift	25.75								+
Peak	NI Hub Bal-Day	2Mar12	2Mar12	HE 0800-HE 2300	+	Hit	50	29.50	32.20	50	Lift									+
Off-Peak	<b>PJM WH Bal-Day</b>	<b>2Mar12</b>	<b>2Mar12</b>	<b>HE 0800-HE 2300</b>	<b>+</b>	<b>Hit</b>	<b>1...</b>	<b>35.00</b>	<b>35.20</b>	<b>50</b>	<b>Lift</b>	<b>35.15</b>								<b>+</b>
Peak Spr	PJM WH Bal-Day/AD Hub Bal Day	2Mar12	2Mar12	HE 0800-HE 2300	+	Hit	50	2.55	3.25	50	Lift	3.20								+
Peak Spr	PJM WH Bal-Day/Indiana Hub RT	2Mar12	2Mar12	HE 0800-HE 2300		Hit	50	8.25	9.45	50	Lift									
Peak Spr	PJM WH Bal-Day/NI Hub Bal-Day	2Mar12	2Mar12	HE 0800-HE 2300	+	Hit	50	3.00	5.50	50	Lift									+
Off-Peak	AD Hub RT Off-Peak	5Mar12	5Mar12	Next Day	+	Hit	50	27.75	32.20	50	Lift									+
Peak	AD Hub Real Time	5Mar12	5Mar12	Next Day	+	Hit	50	34.25	34.50	50	Lift	34.35								+
Peak Spr	AD Hub Real Time/NI Hub Real Time	5Mar12	5Mar12	Next Day		Hit	50	1.00			Lift									
Off-Peak	NI Hub RT Off-Peak	5Mar12	5Mar12	Next Day	+	Hit	50	26.50	30.00	50	Lift									+
Peak	NI Hub Real Time	5Mar12	5Mar12	Next Day	+	Hit	50	28.55			Lift	29.50								+
Peak	NYISO A	5Mar12	5Mar12	Next Day	+	Hit	50	30.25	31.00	50	Lift									+
Peak	NYISO G	5Mar12	5Mar12	Next Day	+	Hit	50	38.00	38.50	50	Lift	38.50								+
Off-Peak Spr	NYISO G Off-Peak/NYISO A Off-Peak	5Mar12	5Mar12	Next Day		Hit	150	2.50	5.00	150	Lift									
Peak Spr	<b>NYISO G/NYISO A</b>	<b>5Mar12</b>	<b>5Mar12</b>	<b>Next Day</b>	<b>+</b>	<b>Hit</b>	<b>50</b>	<b>7.00</b>	<b>8.25</b>	<b>50</b>	<b>Lift</b>									<b>+</b>
Peak Spr	NYISO G/PJM WH Real Time	5Mar12	5Mar12	Next Day		Hit	50	-1.25	-0.25	50	Lift									
Peak	PJM WH DA	5Mar12	5Mar12	Next Day	+	Hit	50	38.25	38.50	50	Lift	38.50								+
Peak Spr	PJM WH Day-Ahead/PJM WH Real Time	5Mar12	5Mar12	Next Day	+	Hit	50	-0.75	-0.50	50	Lift	-0.75								+
Peak	PJM WH Real Time	5Mar12	5Mar12	Next Day	+	Hit	50	38.75	39.25	50	Lift	39.00								+
Peak Spr	PJM WH Real Time/AD Hub Real Time	5Mar12	5Mar12	Next Day	+	Hit	50	4.25	5.00	50	Lift	4.25								+
												4.25								
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												4.50								
Peak Spr	PJM WH Real Time/NI Hub Real Time	5Mar12	5Mar12	Next Day																
Peak Spr	PJM WH Real Time/NYISO A	5Mar12	5Mar12	Next Day																+
Peak	PJM PEPCO DA	5Mar12	5Mar12	Next Day																
Peak	NI Hub DA	5Mar12	5Mar12	Next Day																
Peak	PJM Eastern Hub Day-Ahead	5Mar12	5Mar12	Next Day																
Peak	AD Hub DA	5Mar12	5Mar12	Next Day																+
Off-Peak	AD Hub DA Off-Peak	5Mar12	5Mar12	Next Day																+
Peak Spr	AD Hub DA/AD Hub Real Time	5Mar12	5Mar12	Next Day	+	Hit	50	-0.75	-0.55	50	Lift	-0.75								+
Peak Spr	NI Hub DA/NI Hub Real Time	5Mar12	5Mar12	Next Day																+

Market Statistics

Fin Swap-Peak - PJM WH Bal-Day - HE 0800-HE 2300

High price: 35.35 USD / MWh  
Low price: 32.00 USD / MWh  
Weighted Avg: 34.08 USD / MWh  
Total Volume: 34800 MWhs hourly

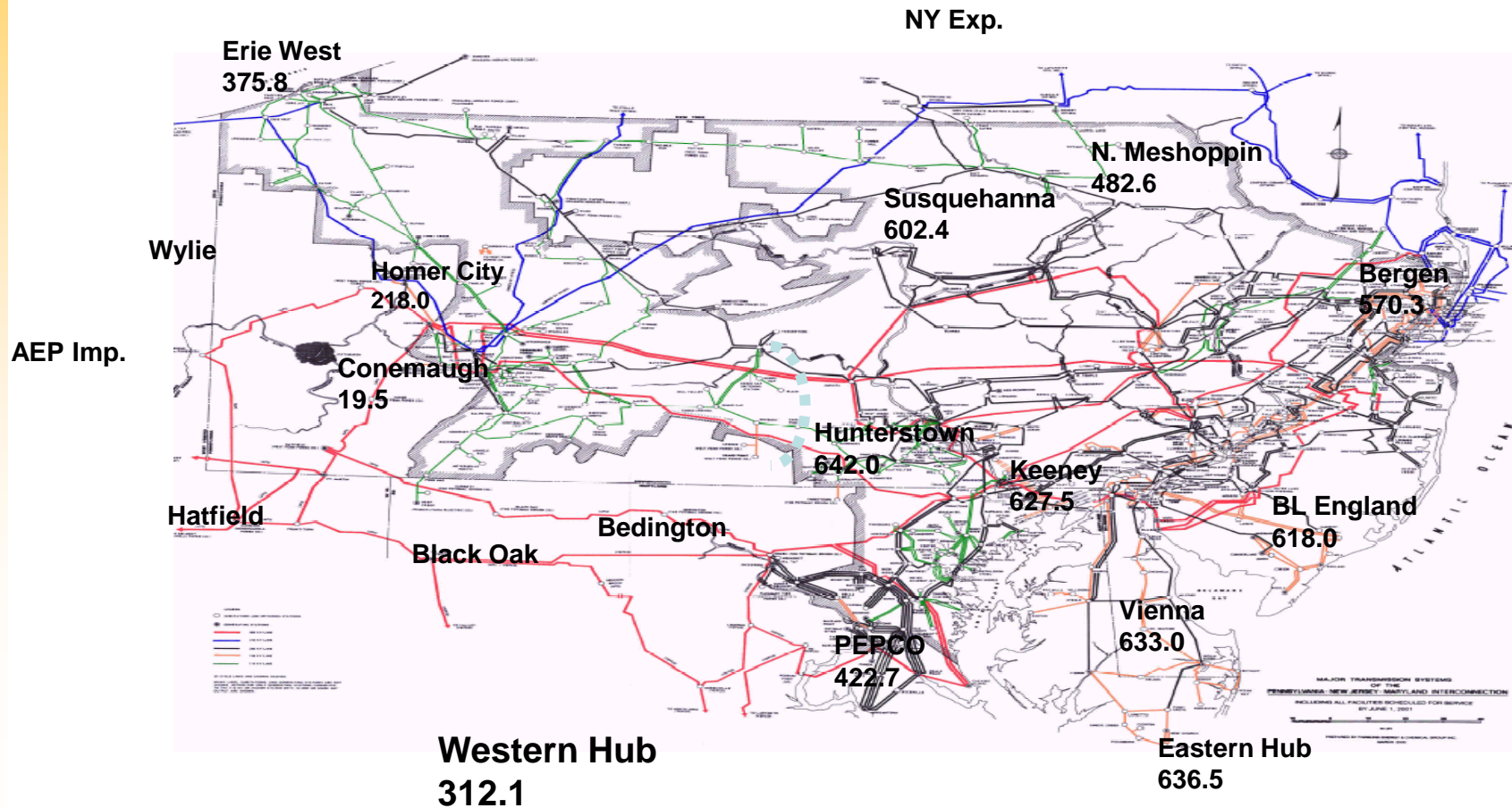
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ISO spot markets provide a transparent, reliable index, and support liquidity

# But Isn't Nodal "Too Complex" For Supporting Liquidity in Long-term Contracting?

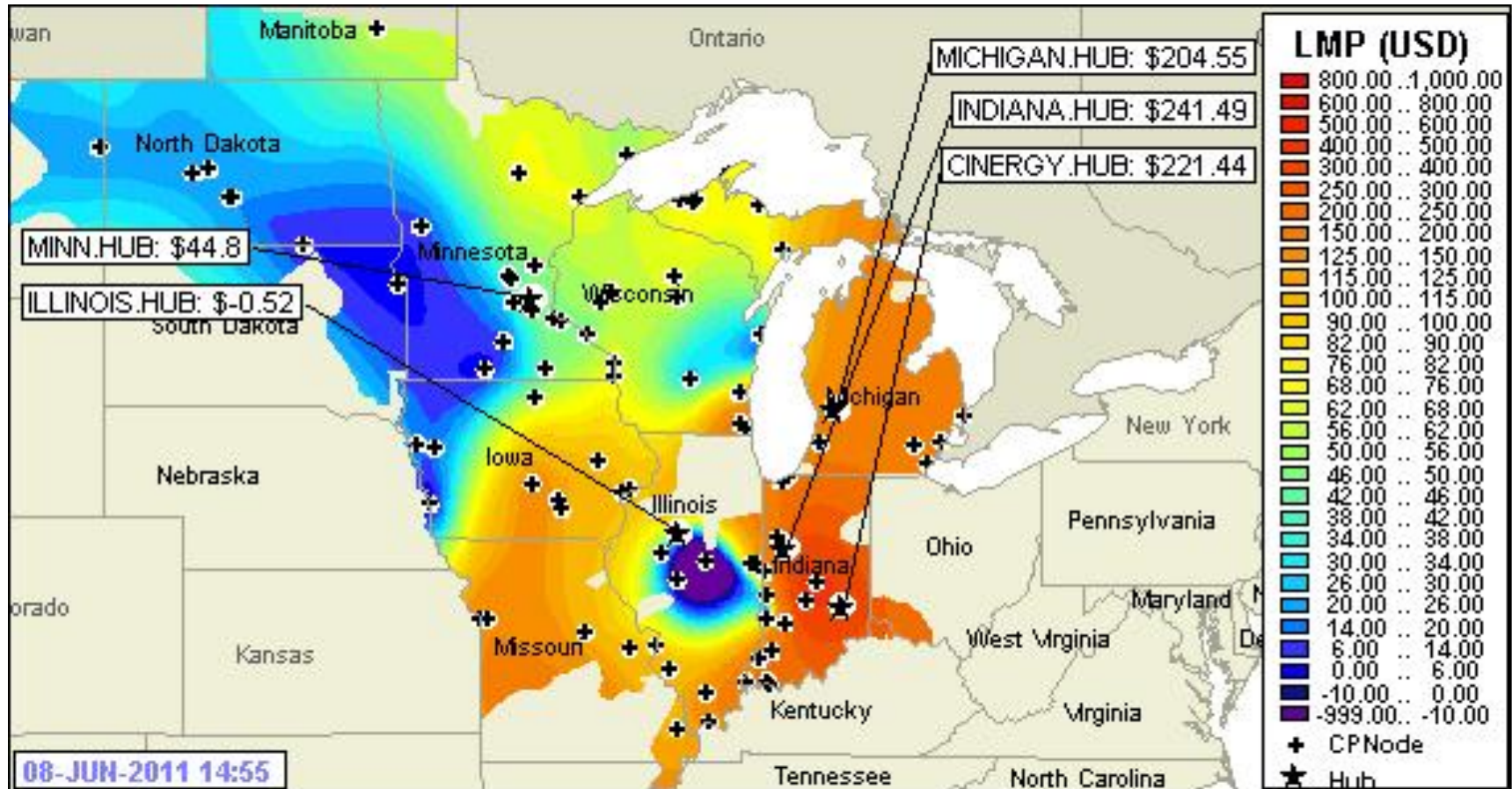
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## Western Interface Constraint



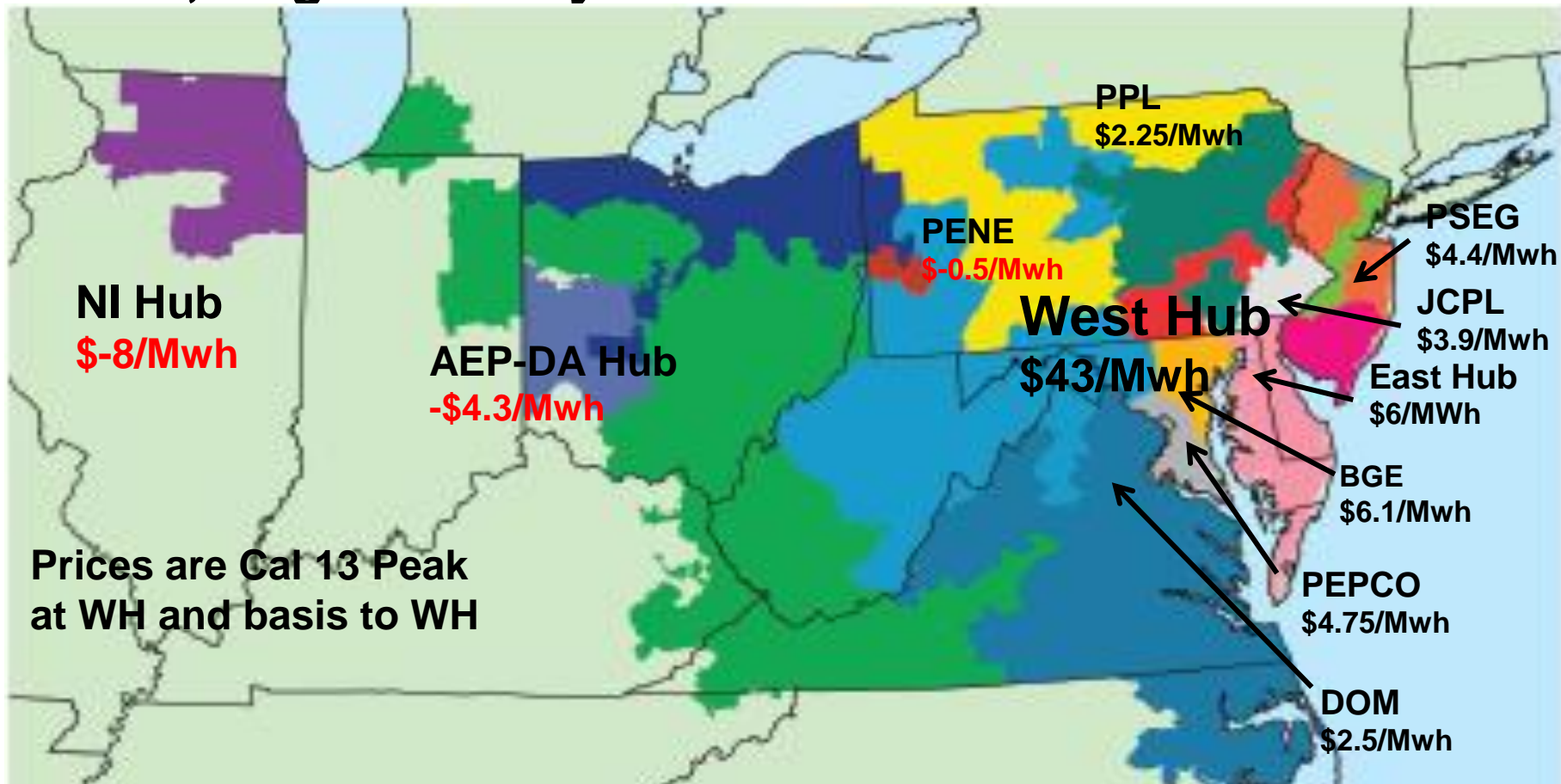


# But Isn't Nodal "Too Complex" For Supporting Liquidity in Long-term Contracting?



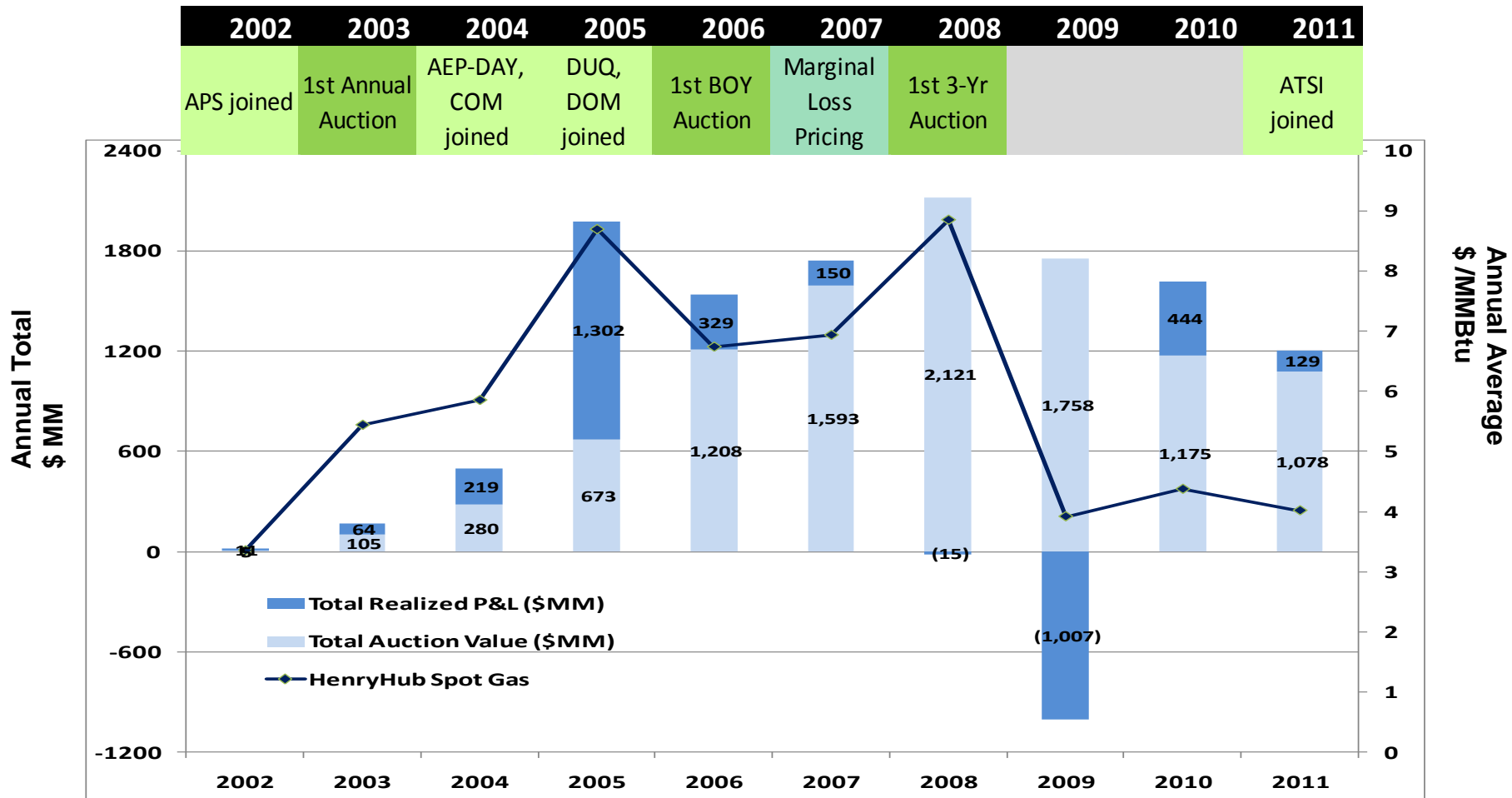


# Nodal Complexity Is Simplified With Traded Hubs & Zones; Augmented by FTR Markets



Nodal prices drive market expectations for forward trading at zones and hubs. These forward prices become the basis for pricing in customer load auctions and forward hedging. With high transparency, some customers become comfortable using the liquid West Hub for market risk and wearing the basis risk. Others hedge basis risk.

# PJM FTR Market Is Extremely Active, Efficient and Liquid as Customers Use FTRs to Manage Basis Risk



Market expansion and new product offerings have created opportunities.

Since 2005, total congestion value has ranged from \$750 million in 2009 to \$2.1 billion in 2008, highly correlated with natural gas prices, among other fundamental factors.

Auction value, thus profit margin, is often negatively correlated with profitability in the previous year.

# FTR Auctions Are Extremely Competitive

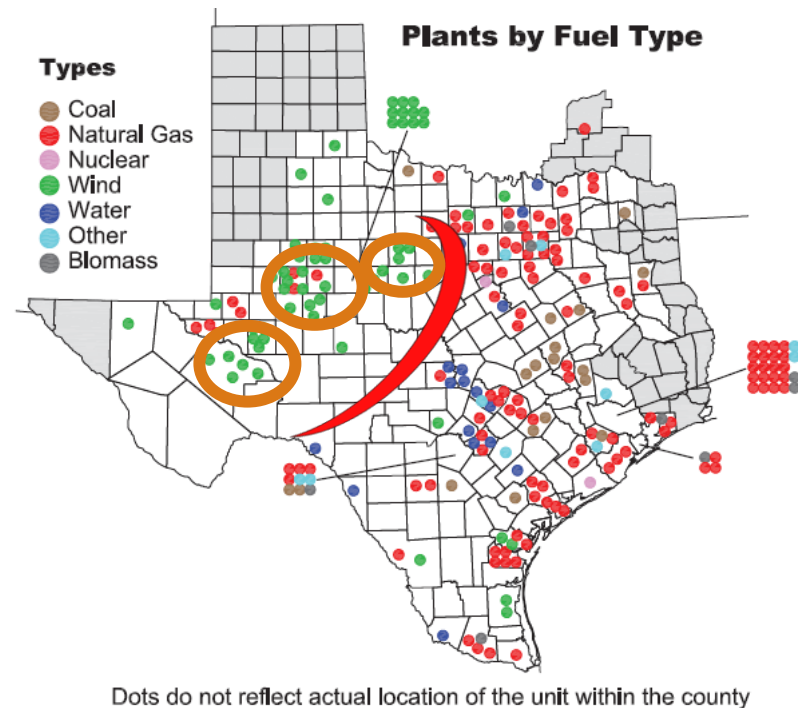
- Market participants actively use FTRs to manage basis risk and speculate
  - 147 participants in 2010/2011 Annual Auction (more in monthly auctions)
  - 185 participants in 2011/2012 Annual Auction (more in monthly auctions)

PJM Annual FTR Auction Market Participants

Allegheny Electric Cooperative, Inc.	BJ Energy, LLC	EPLJCL	Madison Gas & Electric Company
AEPDDB	Black Oak Capital, LLC	EPLJOL	Merrill Lynch Commodities, Inc.
AEPDDB	BLVTNJ	EPLPMB	Morgan Stanley Capital Group, Inc.
AEPDDB	BOC Energy Services, Inc.	EPLPPL	MRTNSV
AEPDDB	BRFRYL	EPLPSG	MTALTO
AEPDDB	BSHNJ	EPLTAR	North Carolina Electric Membership Corporation
AEPDDB	BSRNJ	PPL EnergyPlus, L.L.C.	NRG Power Marketing LLC (DPL DE Base)
AEPDDB	Cargill Power Markets LLC	EXENJ	NRG Power Marketing, Inc.
AEPDDB	Connectiv Energy Supply, Inc. (DPL DE Base)	Exelon Generation Co., LLC (ComEd Gen)	NRGPNJ
Appalachian Power Company (AEP Generation)	Connectiv Energy Supply, Inc. (NJ BGS)	Exelon Generation Co., LLC (Power Team)	NVEC
Allegheny Energy Supply Company, LLC (AP MD Base)	CESPPPL	FirstEnergy Solutions Corp.	Old Dominion Electric Cooperative
AESAPB	Borough of Chambersburg (DTEET)	FESPPPL	Old Dominion Electric Cooperative (South)
AESAVB	Citigroup Energy, Inc.	FPL Energy Power Marketing, Inc. (AF)	Pepco Energy Services, Inc.
AESPER	Connectiv Energy Supply, Inc.		PSEG Energy Resources and Trade LLC
AETSHG	Coral Power, L.L.C.	FPLBGS	RCHLDS
AETSTH	Constellation Power Source, Inc.	FPL Energy Power Marketing, Inc.	Reliant Energy Services, Inc.
AETSWP	CTZECL	FPLMF2	City of Rochelle
Amerada Hess Corporation	Dayton Power & Light Company (The)	FPL Energy Power Marketing, Inc. (DC SOS)	SEEST
AMPBEL	DB Energy Trading LLC	Franklin Power LLC	Southeastern Power Administration
American Municipal Power-Ohio, Inc. (Celina)	DC Energy Mid-Atlantic, LLC	Galt Power Inc.	Sempra Energy Solutions
AMPDAN	Delaware Municipal Electric Corporation	City of Geneva	Sempra Energy Trading Corporation
American Municipal Power-Ohio, Inc. (Dayton Munies)	Dominion Energy Marketing, Inc.	GRGE	South Jersey Energy Company
AMPEPH	Dominion Virginia Power (LSE)	HESVCT	Southern Maryland Electric Cooperative
AMPGOR	DTE Energy Trading, Inc.	The Highlands Energy Group LLC	Solios Power LLC
AMPGPU	EDFFTR	HPER	SOLPMA
American Municipal Power-Ohio, Inc.	EED	HREA	SUEZ Energy Resources NA, Inc.
AMPOMG	EEPI	HWE	Susquehanna Energy Products, LLC
AMPPEN	ELLBAY	Illinois Municipal Electric Agency	UGI Utilities, Inc.
AMPPER	Edison Mission Marketing and Trading, Inc.	INDIANA MUNICIPAL POWER AGENCY	UGI Development Company
AMPPPL	EMTAMB	ITGRD	UGI Energy Services, Inc.
AMPWV	EMTBMB	JPMorgan Ventures Energy Corporation	WELLSB
APMP	EMTDMB	KFWE	Washington Gas Energy Services, Inc. (D)
Allegheny Power (for West Virginia Power)	EMTPMB	Louis Dreyfus Energy Services, LP	WOAKS
ARCLEM	EPLACE	Letterkenny Industrial Development Authority	WPSESR
BATAV	EPLBMB	MidAmerican Energy Company (Retail)	WABASH VALLEY POWER ASSOCIATION, INC.
BEDFRD	PPL EnergyPlus, L.L.C. (DPL DE Base)	MERCEA	Exelon Energy Company
Baltimore Gas and Electric Company (MD HPS)	EPLBUR	Mirant Energy Trading, LLC (Mid-Atlantic)	

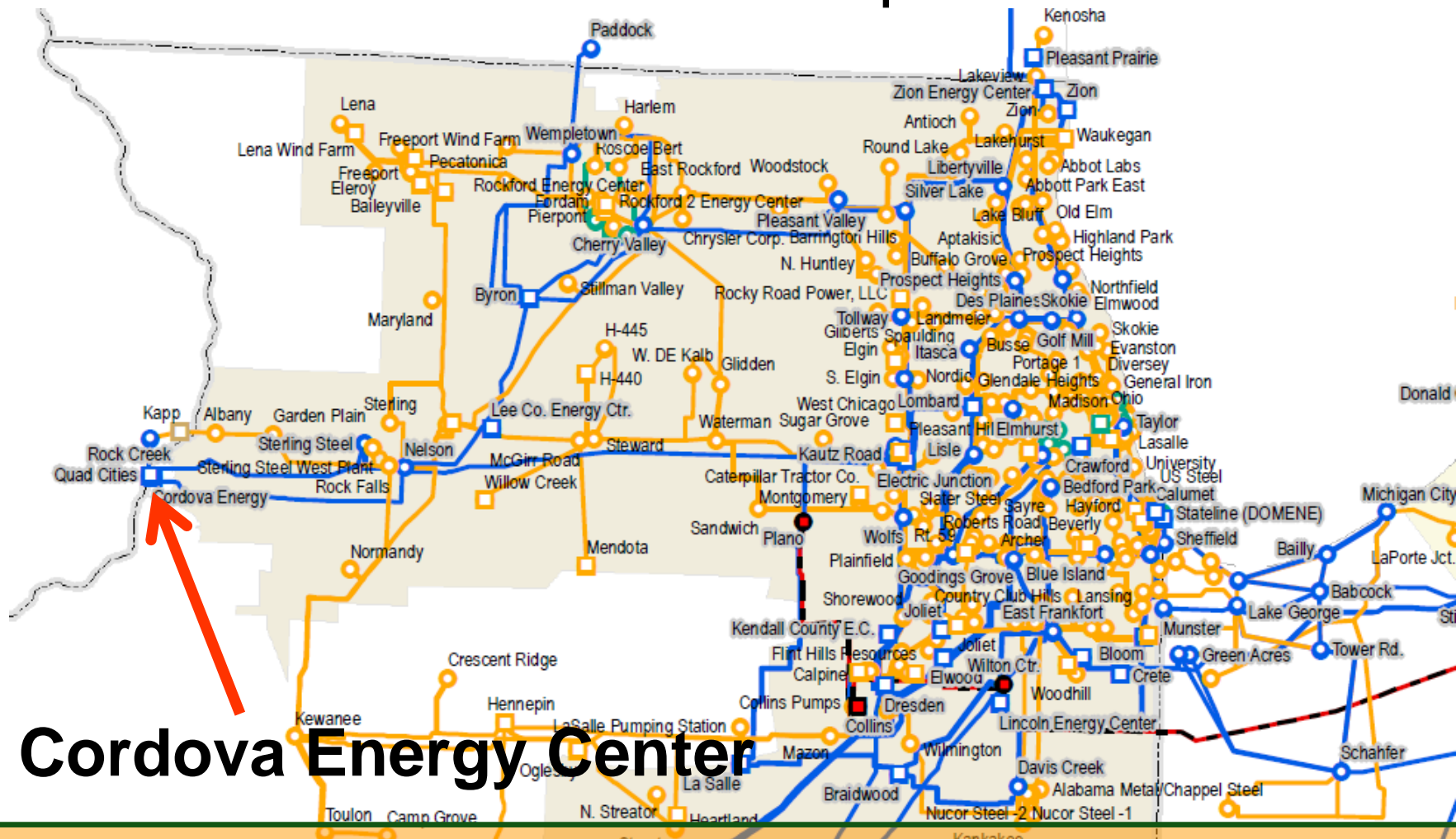
## “Zonal models are both less transparent and require cross-subsidization which creates its own set of perverse incentives”

- Prior to implementation of LMP in December 2010, the ERCOT market extensively used curtailments and “OOME” to manage congestion despite having separate low zonal prices in the West Zone.
  - Curtailments were allocated to units in the West under administrative procedures
- Similar to current situation in Mid-C market.
- With LMP implementation, prices became the dominant mechanism for managing congestion.
- Depending on system conditions, wind areas receive very different pricing, with some Western wind actually getting premium prices



Under LMP, ISO market mechanisms align with the physics of the transmission grid. Market participants can simply follow prices rather than face subsidy-driving curtailment actions by the system operator. The result is far better market signals for long-term transmission investment and siting decisions for new generation.

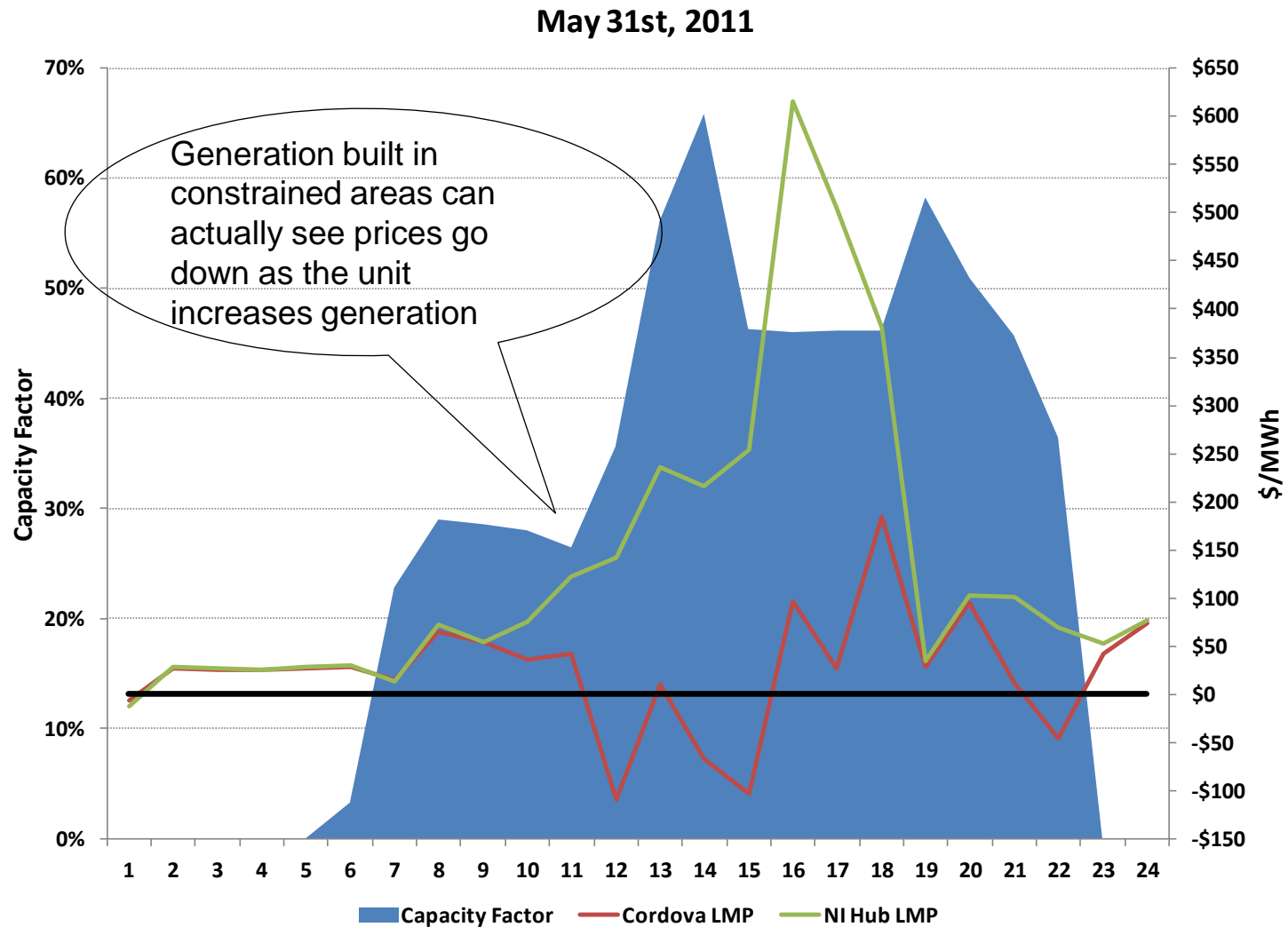
**“Zonal models are both less transparent and require cross-subsidization which creates its own set of perverse incentives”**



During the generation expansion boom in the early 2000s, many generation siting decisions were made without LMP market signals as a guide



**“Zonal models are both less transparent and require cross-subsidization which creates its own set of perverse incentives”**





# Volcker Myths

Myth 2: Banks have virtually in-exhaustible access to capital at low cost (pre-2008 perception)

Myth 3: Liquidity from hedge funds and exchange clearing can entirely replace the banks' role in the power market

Myth 4: Bank "customer business" and proprietary trading are clearly distinguishable

Myth 5: Power markets are "liquid" (i.e. Banks can do "customer business" in power without warehousing the financial risk)

# What Will the Volcker Rule Do to Liquidity?

- Impact of Volcker unclear – depends on the rule details and how it will be implemented (mild impact, drastic re-alignment, or in between?)
- Banks make money by extending credit to counterparts. They also make money by taking on market risk. The charge for both is implicit in their bid/ask spread. Their balance sheet supports their capacity to extend credit and take risk.
  - In contrast futures exchanges have no balance sheets so they only do paired transactions and require cash margin
  - In theory, banks can provide liquidity (at a price) that exchanges may not
- What is “Customer Business?” (from a layman/customer’s perspective)
  - Forward contracts
  - Tolling deals
  - Structured transactions
  - Hedging – low- or no-margin hedging where bank has “right-way risk”
  - More complicated structures combining financing, hedging and options
  - Banks historically do these across a wide range of products and markets, diversifying risk

Essentially, banks make money by – for a profit -- providing access to their enormous balance sheets and low-cost capital (i.e. extending credit)

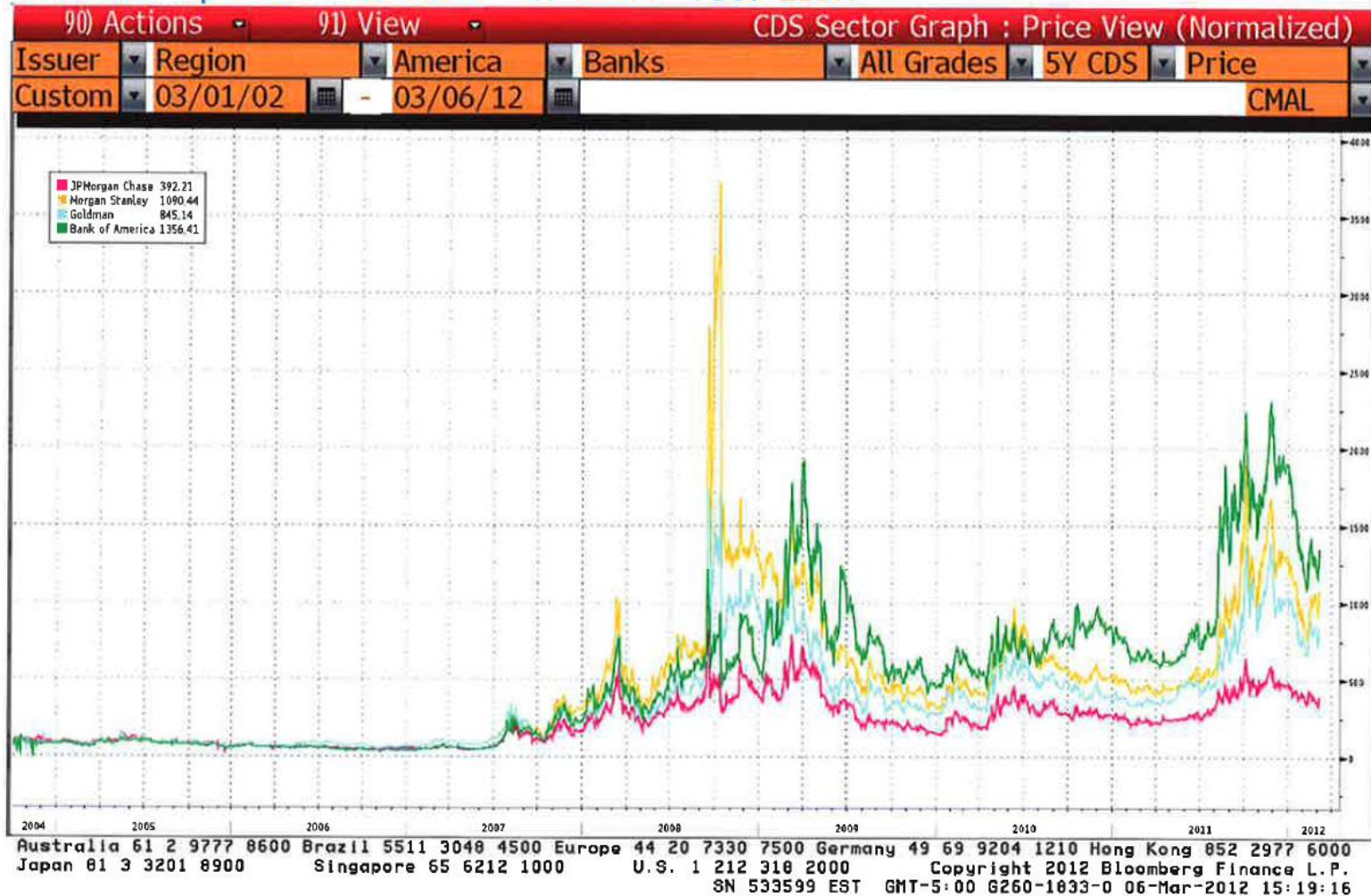
- Merchant banks historically used their own capital – plus lots of leverage
- In 2008, they all became members of the FED system now subject to leverage constraints

# From a Customer Perspective, Banks' Counter-party Risk Looks a Lot Higher Than Prior to the Financial Crisis

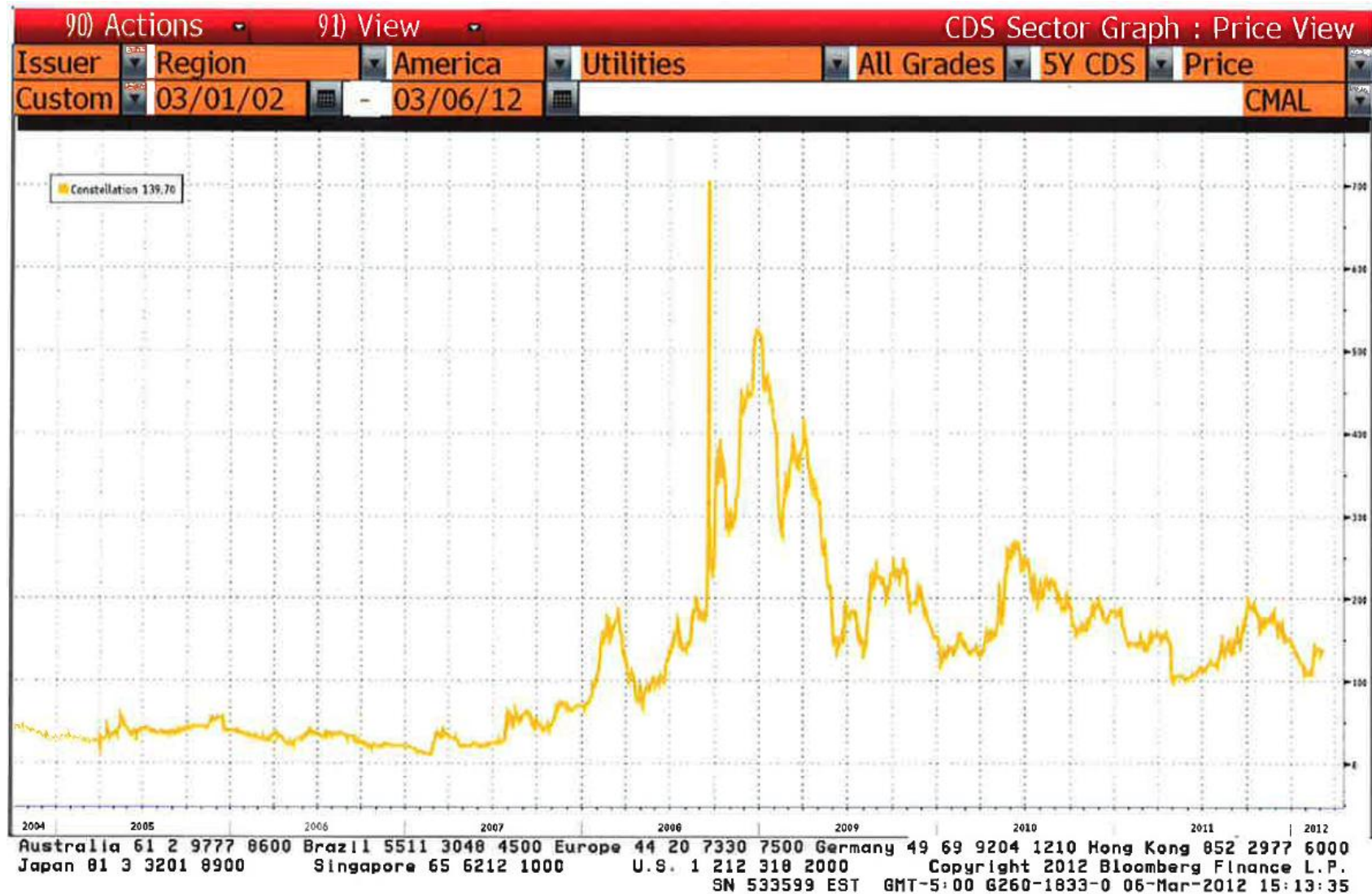
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CurrencyGCDs

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# From a Customer Perspective, Maybe I can turn to an IPP like Constellation? ...

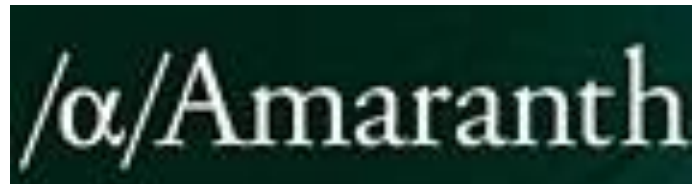




## ...Or a Market Participant With a Huge Balance Sheet Like BP?



...Or One of Those Really Transparent Hedge Funds That Periodically Go Kerpuff?





# Illiquidity in Power Markets -- Implications

- As a customer, when we trade with a bank, what distinguishes the prop trades from customer business?
  - In both cases the bank's objective is to make money
  - Is any counterparty to a prop trade a customer?
- If Volcker defines “prop trading” as the warehousing of risk, it will be tricky for banks to justify and maintain their traditional role in power. Power is vastly more illiquid than other bank activities (equities, oil, gas, other commodities, CDS, mortgages, etc.)
  - No way banks can do traditional long-term Power business without warehousing risk
  - How effectively (and competitively) can banks price “customer business” if they don't have a strong, active prop desk?
- Perhaps Volcker implementation creates a power market exception (given lack of systemic risks associated with the scale of the business), but this is unlikely

# Will Volcker Adversely Impact the End Goal of Efficient Long-term Markets?

- Regardless of the Volcker rule, ultimately, one would think most “customer business” transactions will find a way to get done to the extent that there is the financial incentive and profit opportunity whether by banks, bank subsidiaries, bank affiliates, IPPs, private equity, hedge funds, alternative players, etc.
- But the landscape may be changing -- for higher-risk-profile entities, it is less clear how they will access capital for longer-dated transactions where merchant banks traditionally played a key role as the off-taker