US NATURAL GAS MARKET: PERPETUAL RE-BALANCING ACTS

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Natural Gas North America
Research & Forecasts

April 2015 – 12th International JODI Conference, New Delhi, India

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OUTLINE

I. Current State of US Gas Markets: The Sick Patient is Better

II. North America Natural Gas Fundamentals: Highlights of Current Historical Trends

III. Data Availability and Analysts Needs

IV. An integrated approach at fundamentals forecasting

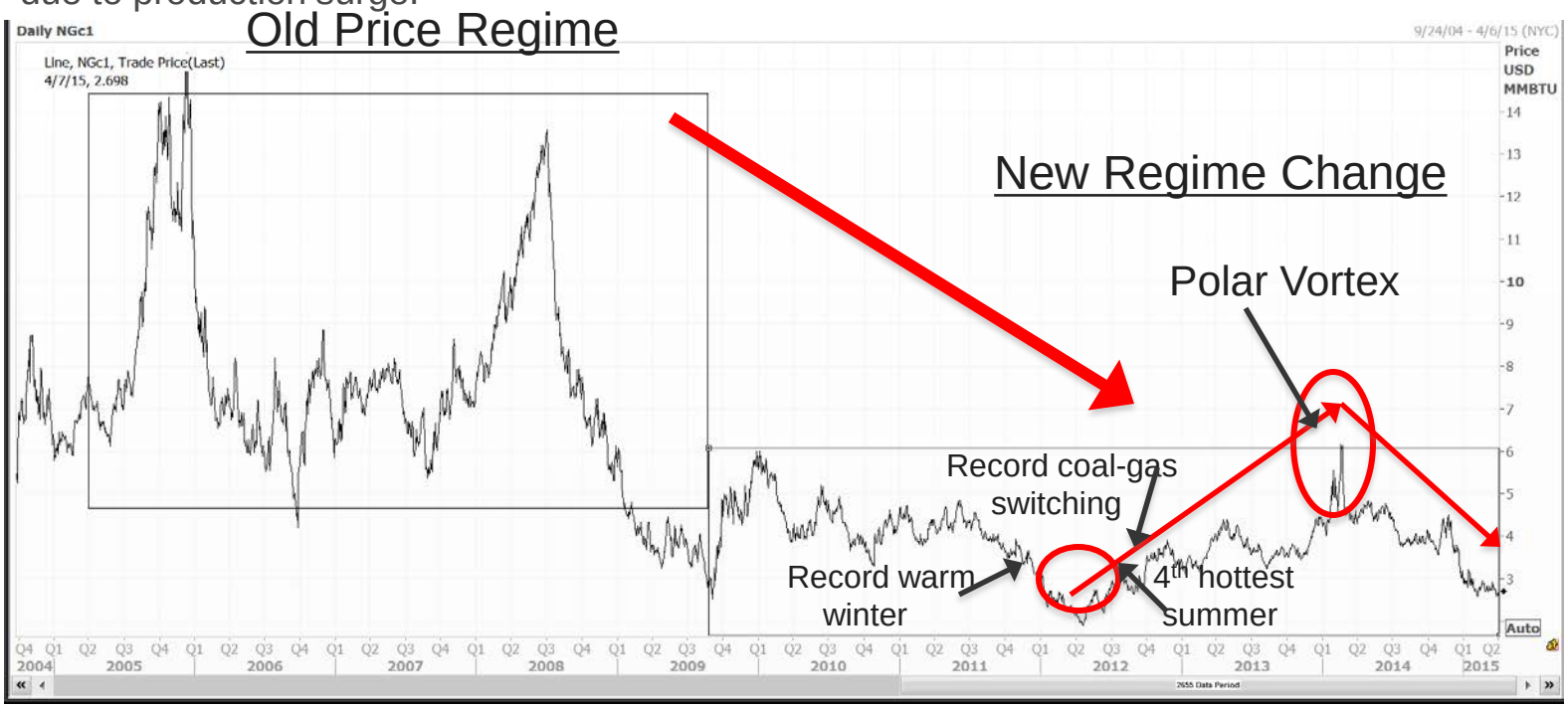
V. 6 Food for Thought Cases: Some US Data Experiences as Key Takeaways for JODI in the future

Price Trends

and Trading Activity

US Natural Gas Prices

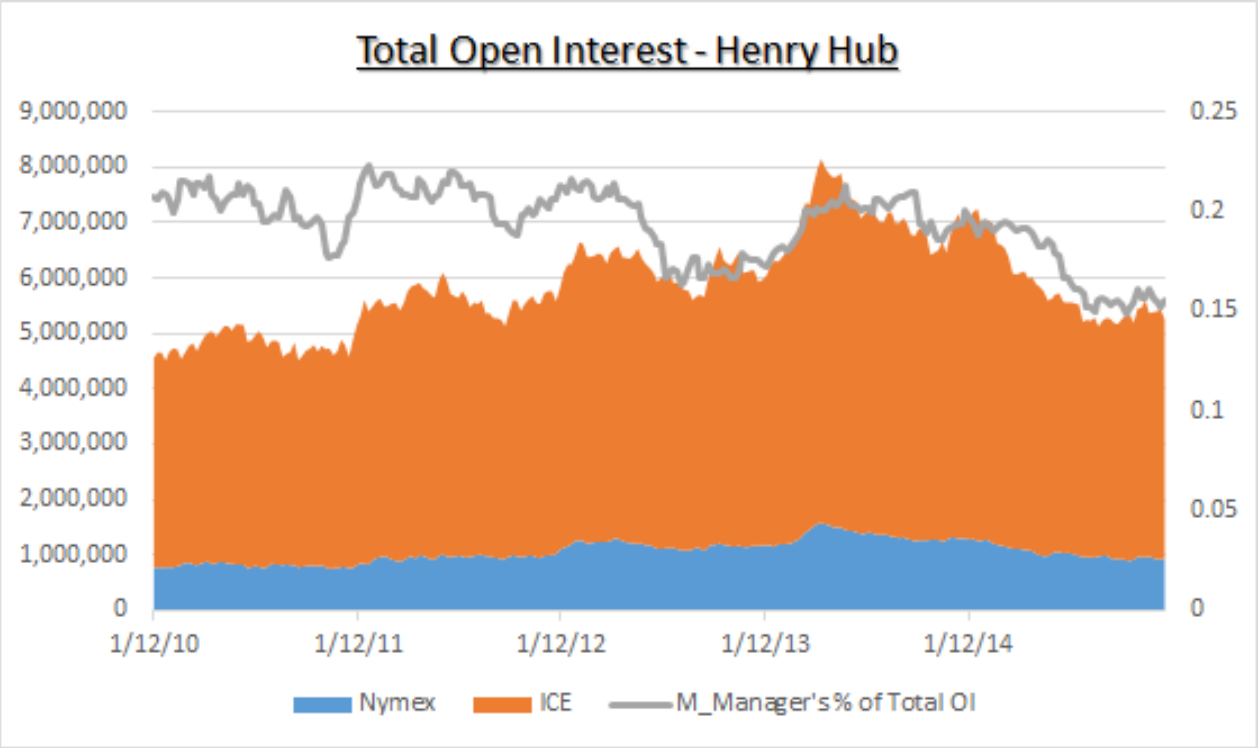
- Pre-shale gas: $6-8/MMBtu prevailed with spikes above $10/MMBtu (2005 – 2009); Shale production pressured prices below $2/MMBtu (April 2012);
- Record-levels of coal-gas switching and 4th hottest summer "rescued" prices to $3-4/MMBtu (reflecting some overall average marginal cost production).
- "Polar Vortex" winter of 2013/14 brought back memories of old days, high volatility and Henry Hub above $6/MMBtu (NE above $100/MMBtu); but now back below $3/MMBtu due to production surge.



Source: CME, Thomson Reuters

Open Interest at Healthy Levels

- Open Interest at ~5.2 Million futures contracts open on ICE and Nymex (End of 2014); valued at ~$157 Billion USD. Peak came around April 2013 at 8.2 MM open contracts.
- Money Managers (funds) holding lower % of total open interest.



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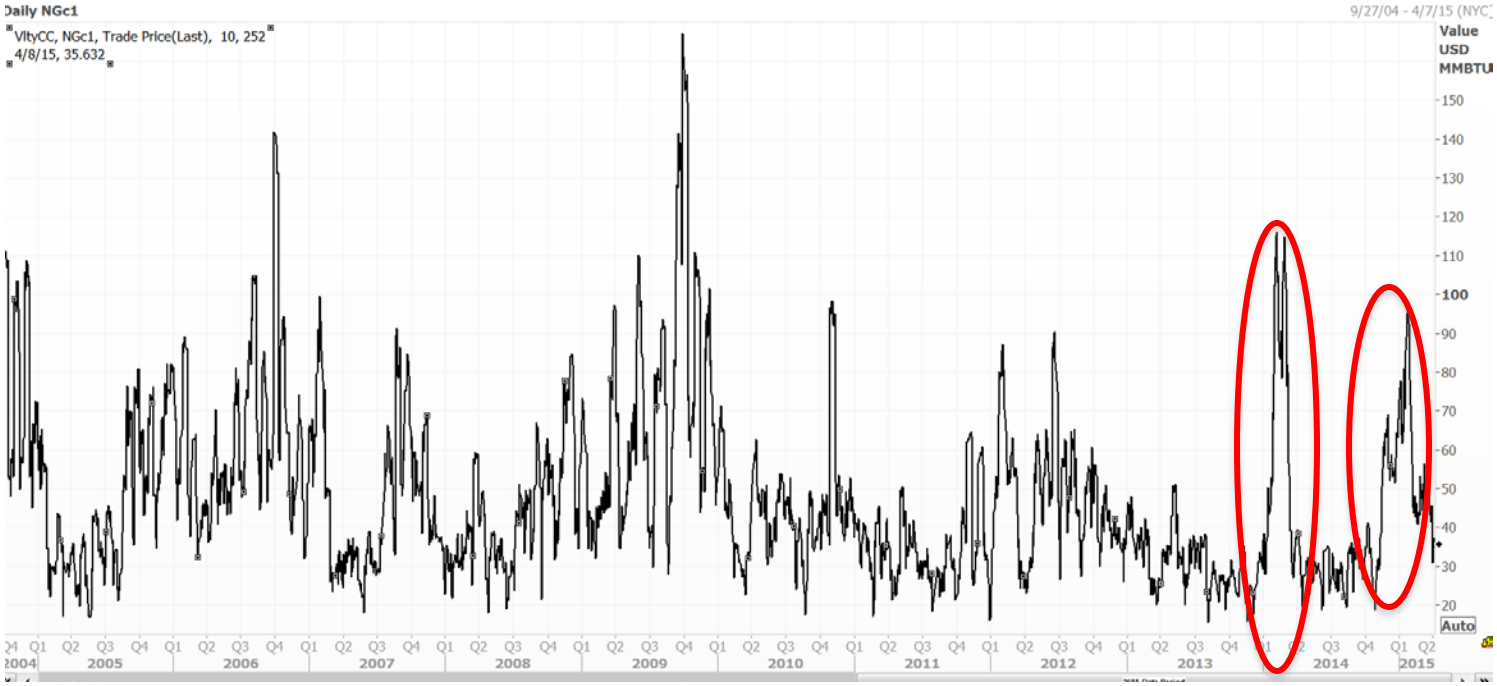
Source: Thomson Reuters, CFTC

Volatility Attracts Diverse Market Participants

- Volatility over 2013-14 winter rivaled pre-Shale levels.
- Volatility, although overall lower during Shale era has never disappeared – Uncertainty in the ***future*** Balance has kept it alive.



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Source: Thomson Reuters, CME

North America Natural Gas Fundamentals:

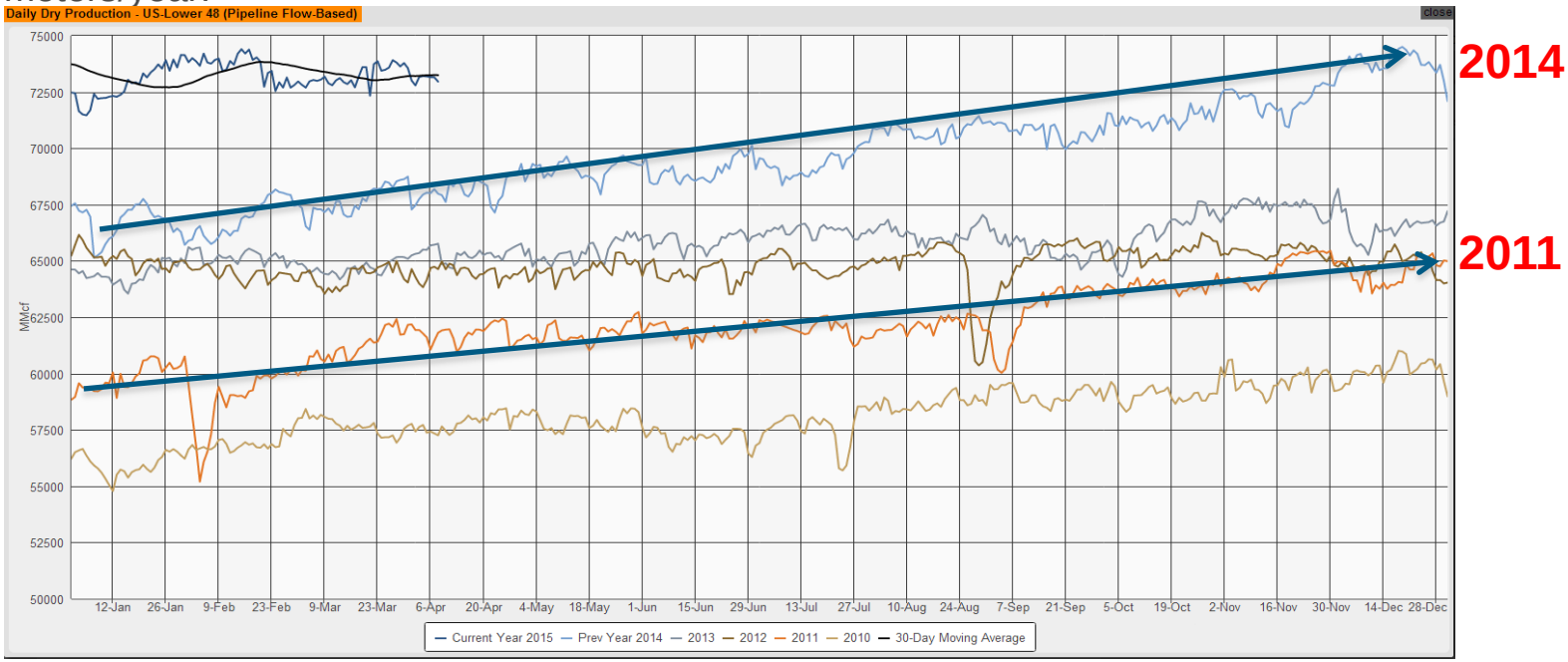
Highlights of Current Trends

Supply Trends:

Production and Canadian Imports

Dry Production

- Production peaked in early 70s at 59 Bcf/d. Between 1994 and 2000 dry production was steady at 51 Bcf/d before slowly declining from 2001 to 2005, which led to tight balance.
- Starting 2006, saw 1-2 Bcf/d YoY growth until 2011 which exploded +4.3 Bcf/d YoY.
- Market took a breather 2013 with less than 1% growth responding to low rig counts; but in 2014 another massive 3.8 Bcf/d growth to current estimate 73 Bcf/d (near record 73.8 Bcf/d back in Feb '15). Current production highest in world (750 MM cubic meters/year); next highest Russia at 650 MM cubic meters/year, distant third at 160 MM cubic meters/year.



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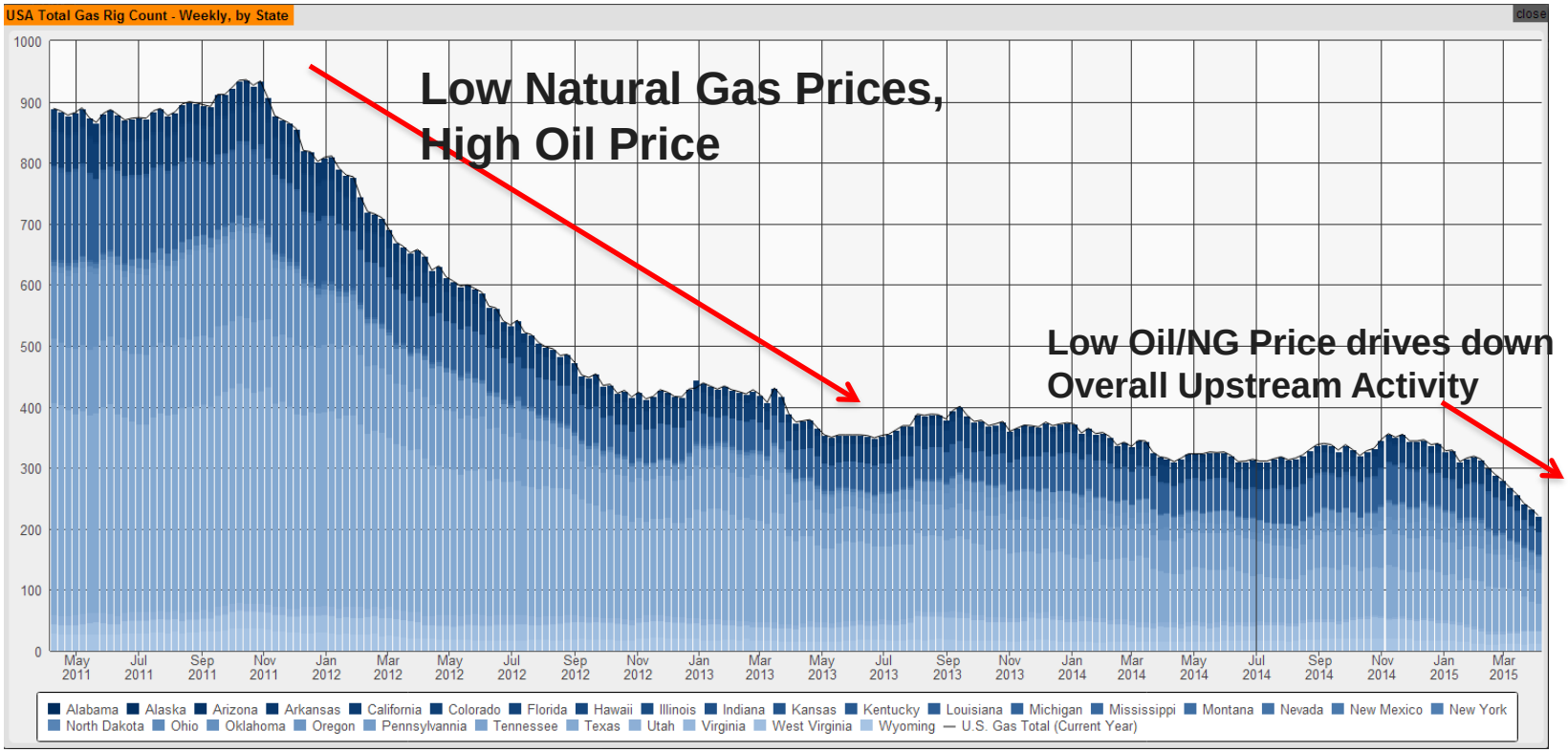
Source: Thomson Reuters Natural Gas R&F; PointLogic

Rig Counts on the Decline, but not Production Volumes



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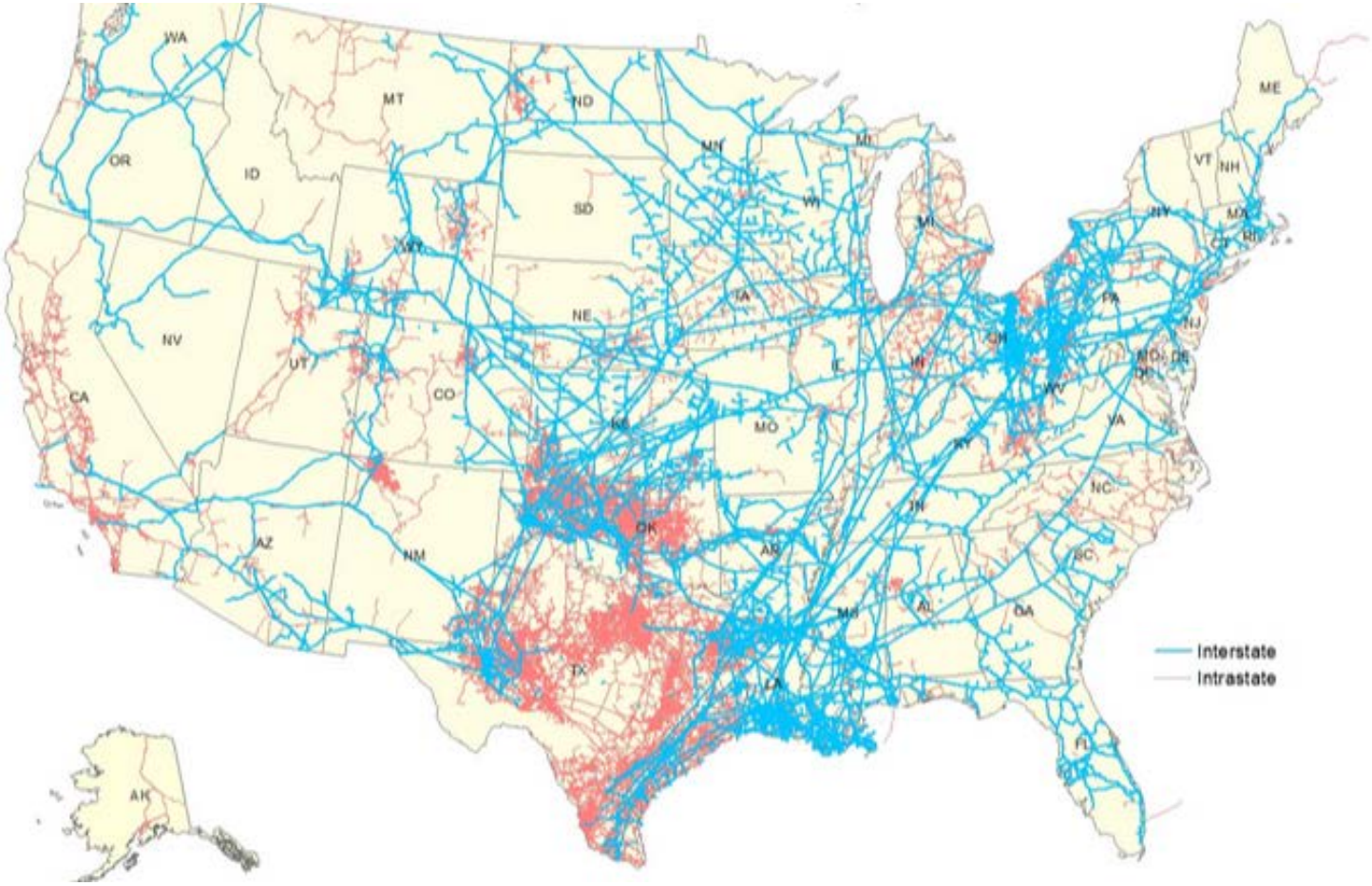
305,000 miles Intra and Interstate Pipelines, 210 Pipeline Systems



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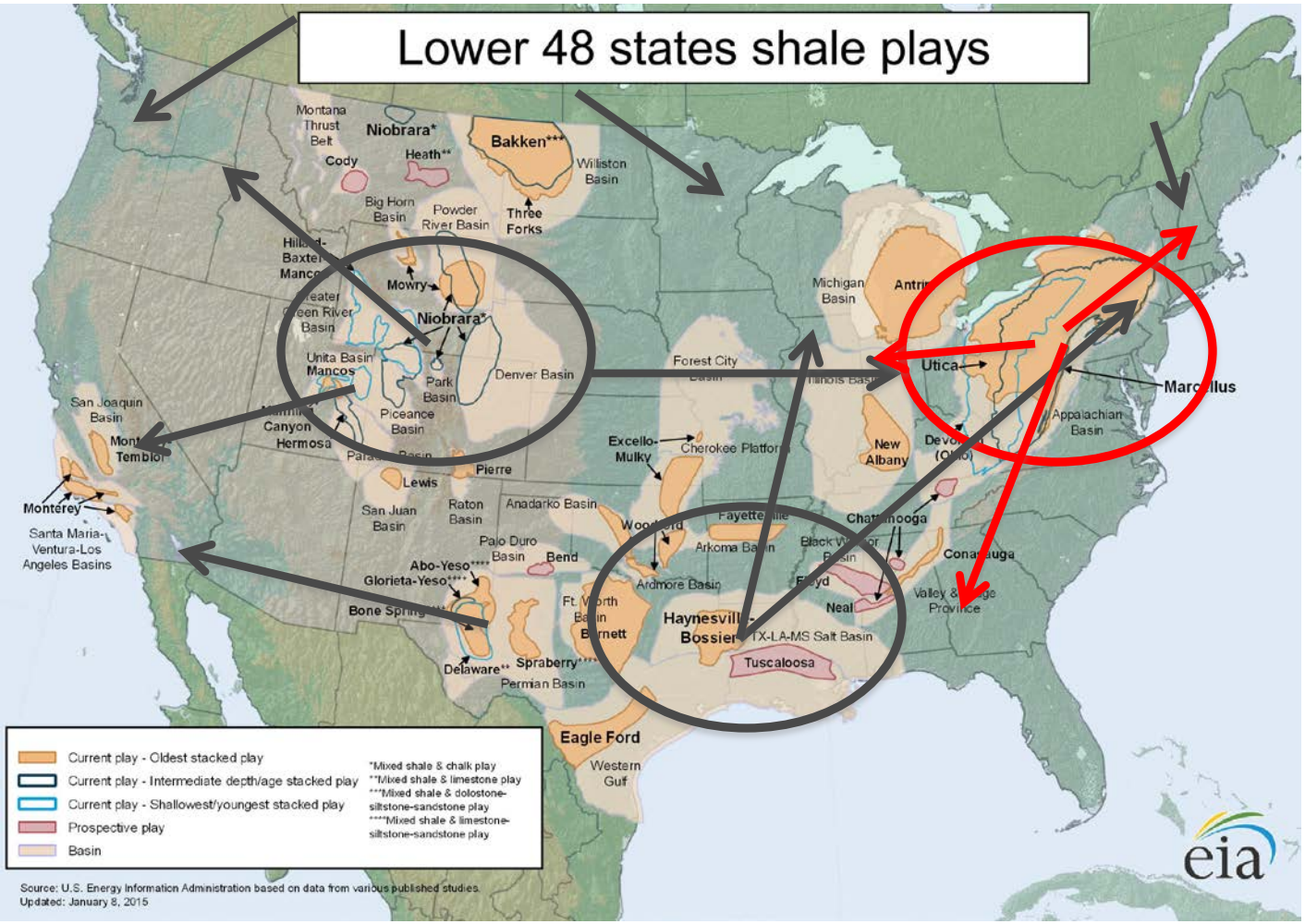
Burgeoning Supply in NE: Shifting Flow Patterns

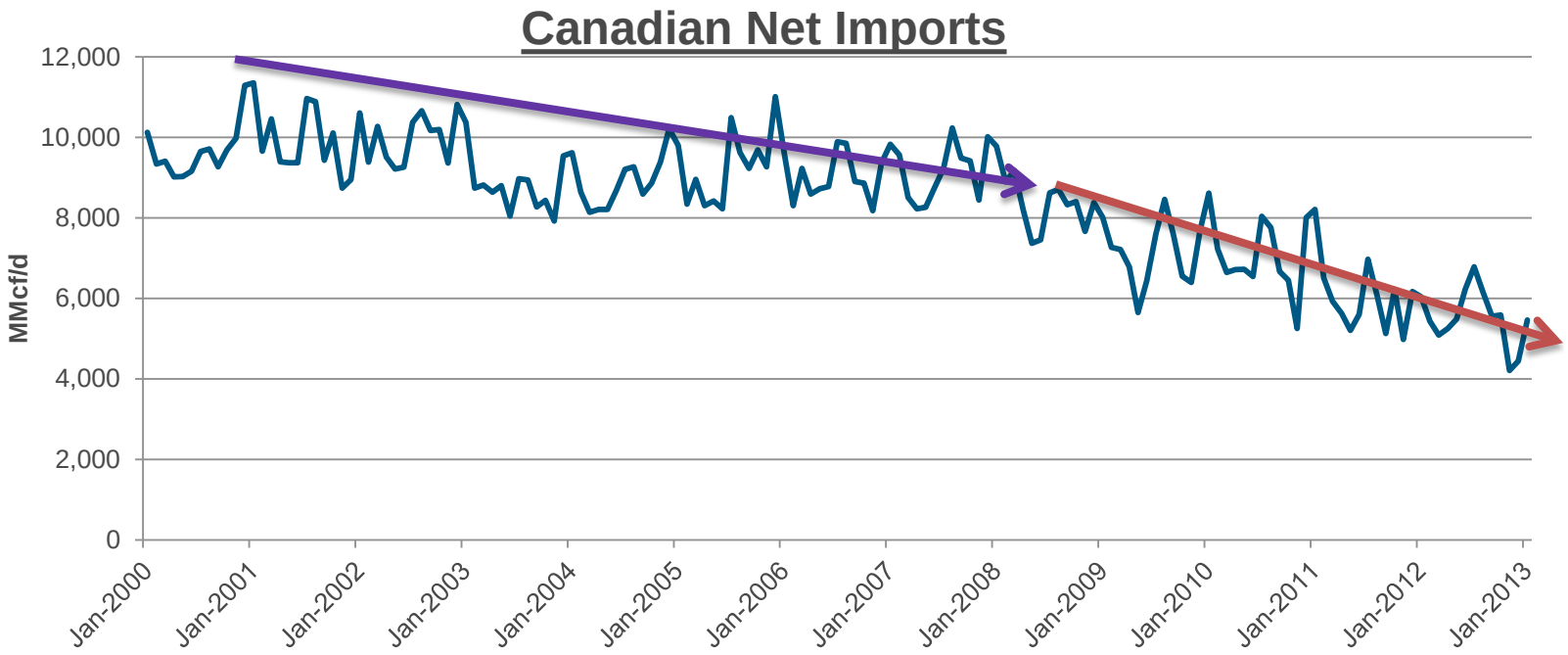


Regional Rig/Production Dynamics

- As of March 27, natural-gas directed rig count fell to all-time low of 222 (9th decline in a row). Natural Gas rigs down 30% (Baker Hughes data) since Jan 2014.
- Declines are seen in expensive gas basins like Haynesville, Fayetteville Shale, and oil-rich plays like the Permian Basin. Marcellus and Utica and Bakken the rig counts are staying more steady.
- Multi-well pad drilling phenomenon: optimization technique to get more gas production out of the same number of rigs, and producer's decision on "up-rating" drilling programs keeps squeezing out more with less.
- Horizontal rigs now hold 70% of total rig count, up from 48% in 2010.
- We believe the low rig count will translate into slower growth, not an overall production decline in 2015 (+3.3 Bcfd YoY). Production lag is about 6-8 months currently compared to 2008/9 which was 3 months. We believe a peak will be observed by end of Q3-2015.
- Up to 720 wells will deferred due to Oil contango; rigs are under contract so drilling programs may proceed but completions deferred. Labor is under contract.

Canada – Net Imports

- As Canadian production grew in the ‘80s and ‘90s, so did net exports to the US Lower-48, peaking at 10.1 Bcf/d in 2001.
- However, imports have been falling for the past 10 years
- The decrease has accelerated most recently hovered around ~ 5 Bcf/d.



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Source: Energy Information Agency

Canada – Production & Storage

- After steady increases in Canadian natural gas production between 1986 – 2006 production (18 Bcf/d) went into decline.
- However, Western Canadian production has recovered nicely and at highest levels since 2009, despite AECO average 2015 cash price of $2.22/MMBtu.
- This has resulted in 2nd highest storage levels ever in Eastern Canada (215 Bcf) entering 2015.
- Coldest winter since 2004 depleted storage to their 2nd lowest level since 2004.
- Imports into the Northeast US are expected to remain steady given Marcellus supply is being pulled by multiple regions.

Source: National Energy Board, StatsCanada
Bentek

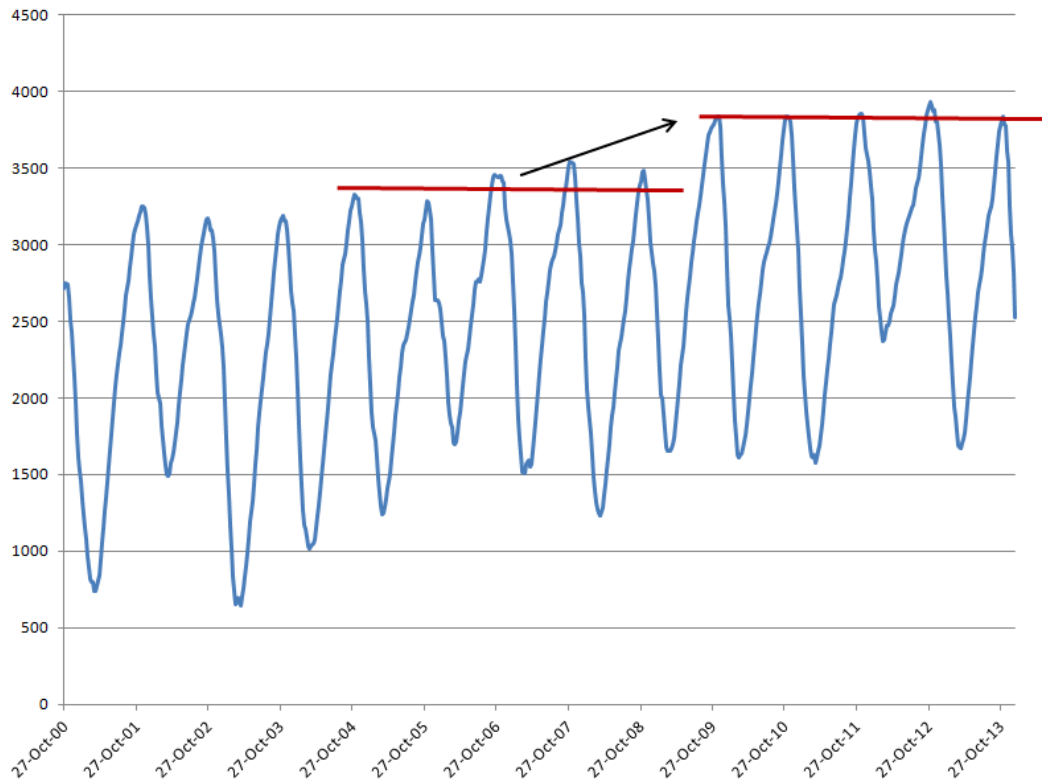
Following the Molecules in/out of Storage

- Shale Gas impacts Storage economics

- Flattens forward curve, making calendar arbitrage less interesting

- Basis volatility disappears as well, save the Northeast on a handful of winter days

- Market experiences storage level regime change: winters start with 3.8 – 3.9 Tcf of natural gas in storage instead 3.2 – 3.5 Tcf when prices were much higher/volatile.



Source: Thomson Reuters Natural Gas Analytics

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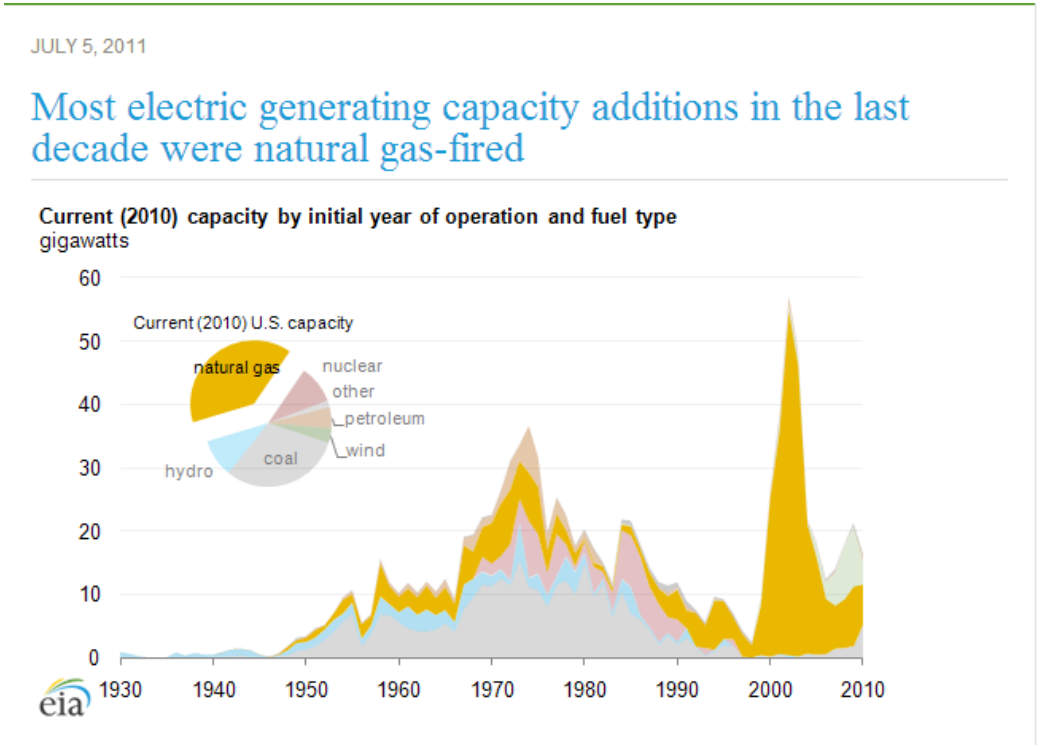
Demand Trends:

Gas-for-Power, Industrials, Exports to Mexico, LNG

US Gas-to-Power Generation: History

- Natural Gas prices were very low for all of the 1990s due to flat domestic demand. This incentivized a large build-out of efficient combined-cycle gas-fired power plants.



- But natural gas prices tended to spike on high load days which made utilities suffer the financial consequence of buying wholesale gas.

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Source: Energy Information Agency

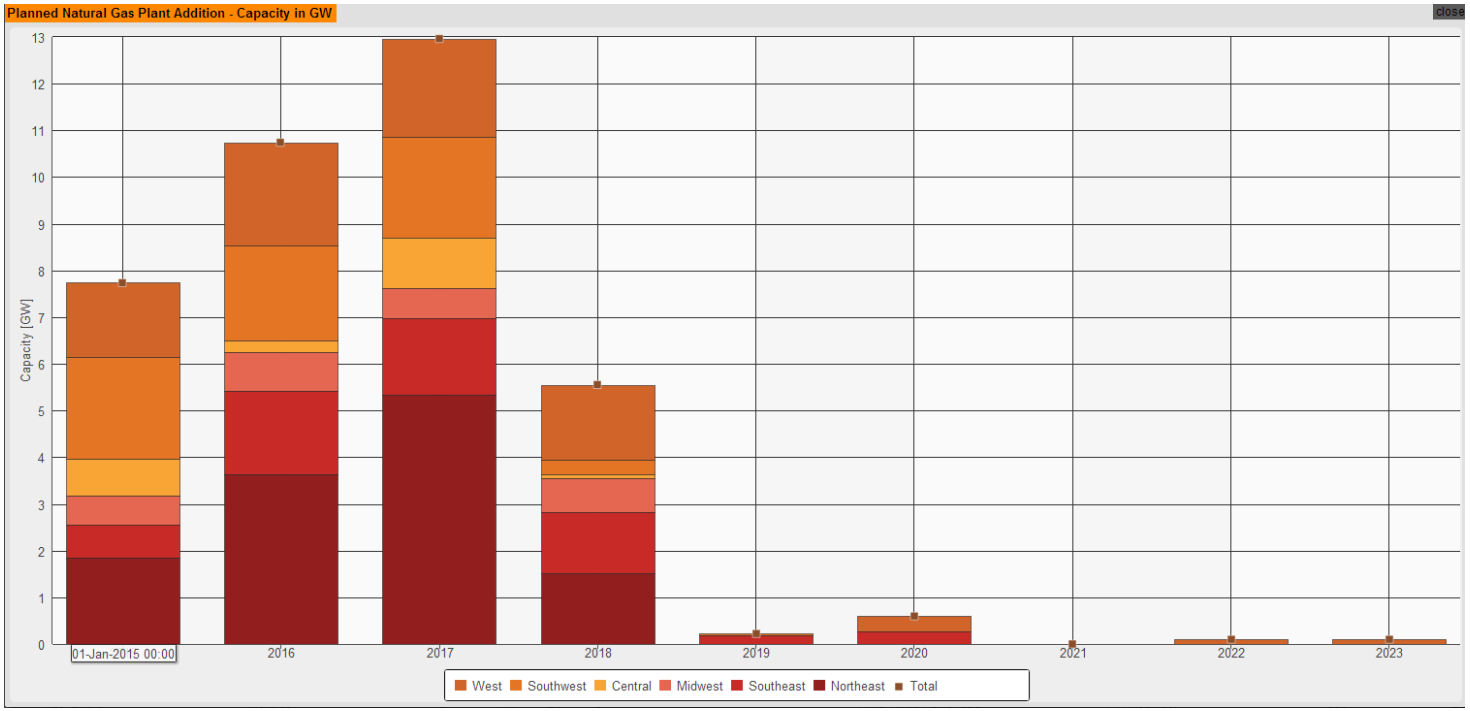
Gas-for-Power Generation

- Coal-gas switching economics: after hitting unprecedented levels in April 2012 (>10 Bcfd) - May ’12 that for 1st time ever natural gas usage for power generation almost equaled coal as fuel, both ~32%. Fell back dramatically by 2013 to 2.2 Bcfd.
- Current Levels of 6.2 Bcf/d have not been seen since 2012 low natural gas prices.
- AsUS becomes more reliant on natural gas as the fuel type of choice for power gen, energy security and price volatility become a concern. FERC now in process of helping power and gas industries better harmonize their respective spot delivery schedules.
- Environmental regulation: MATS (Mercury Air Toxics Standard) and Carbon Targets for States. Latter rule more impactful, can result in 1 Bcfd of additional Gas Burn in 2015 and +8.7 Bcfd by 2030. This amount of Gas Burn (presuming no secular growth), translates into **62 GW of baseload coal plants forced to retired** (assuming a 70% capacity factor). This compares to 36 GW of currently announced coal plant retirements through 2025.

Source: Energy Information Agency

Coal Plant Retirements, Nat Gas Additions

- 49.5 GW of NG plant additions planned. @ 70% c.f. gas generation would cover 70% of the proposed new dispatch schedule. So, even with no new EPA rule, the announced new natural gas plants would already cover most of proposed increase.



Source: EIA and Reuters Editorial

Renewables & Energy Efficiency

- High Hydro generation winter in the Pacific expected to turn into a low hydro generation summer; snow pack is at 8% normal in West, drought conditions (bullish for natural gas).
- 2014 Wind Capacity grew 372 MW YoY to 15 GW. On certain very windy days, wind in Texas can displace upward of 2 Bcfd of natural gas demand.
- 2014 Solar Capacity grew 2,500 MW YoY to 7.7 GW.
- New England ISO conducted a study recently showing that they expected zero power generation growth through 2020 due to mitigating effects of energy efficiency alone.

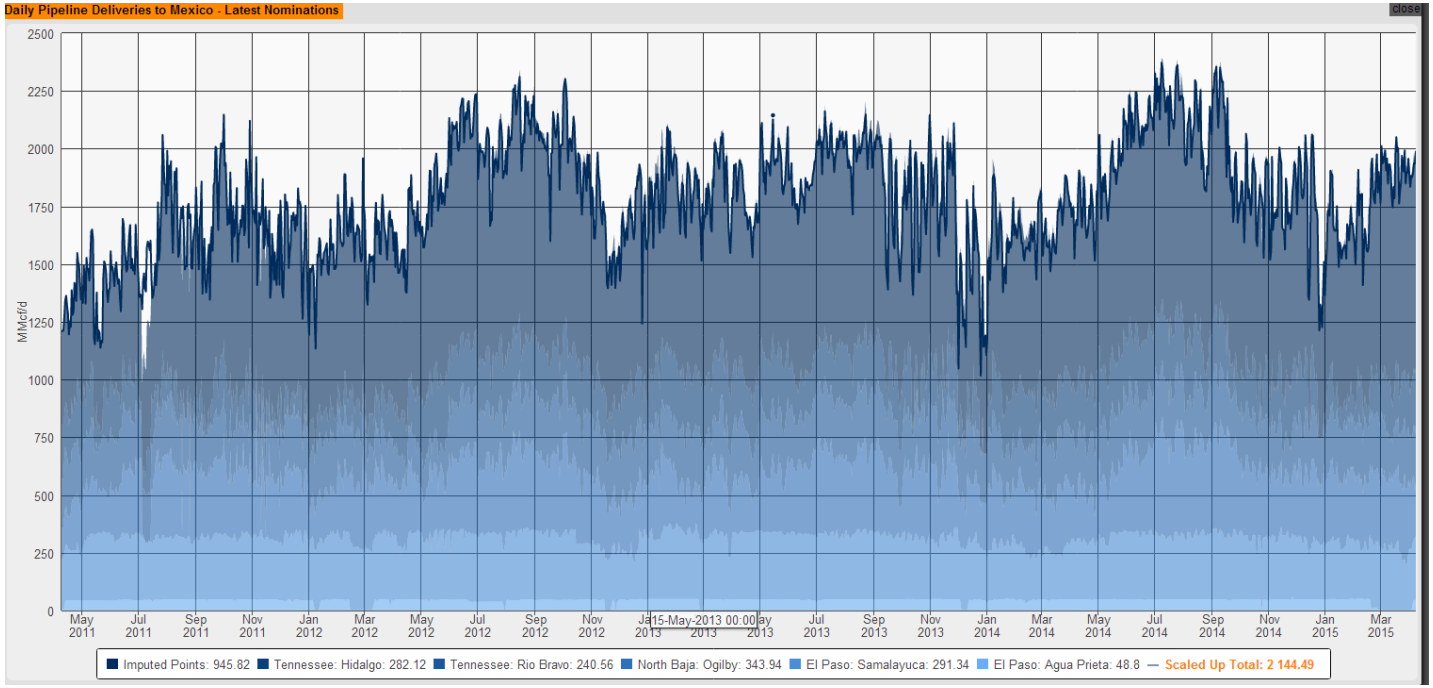
Industrials

- We have observed 2 Bcf/d growth in Industrial growth over the past 2 years.
- 157 projects to go online in March, adding 116 MMcf/d of demand if all of them start at 80% capacity. OCI Partners's Methanol and Ammonium project would be biggest at 65 MMcfd at 80% load factors. 13 projects in TX and 7 in LA. 107 projects are scheduled for service in December and 32 industrial projects in June.
- More than 300 industrial expansions due to come online in 2015. The biggest plant to go online would be fertilizer plant in Iowa (~97 MMcfd) by August 2015.

Source: TR NG R&F, Bentek, IIR

Mexican Exports: Added Capacity, Higher Volumes

- We have observed a 1 Bcf/d increase in peak daily exports since 2010 and now more than 2 Bcf/d flow cross border.



Sources: Thomson Reuters, PointLogic Energy

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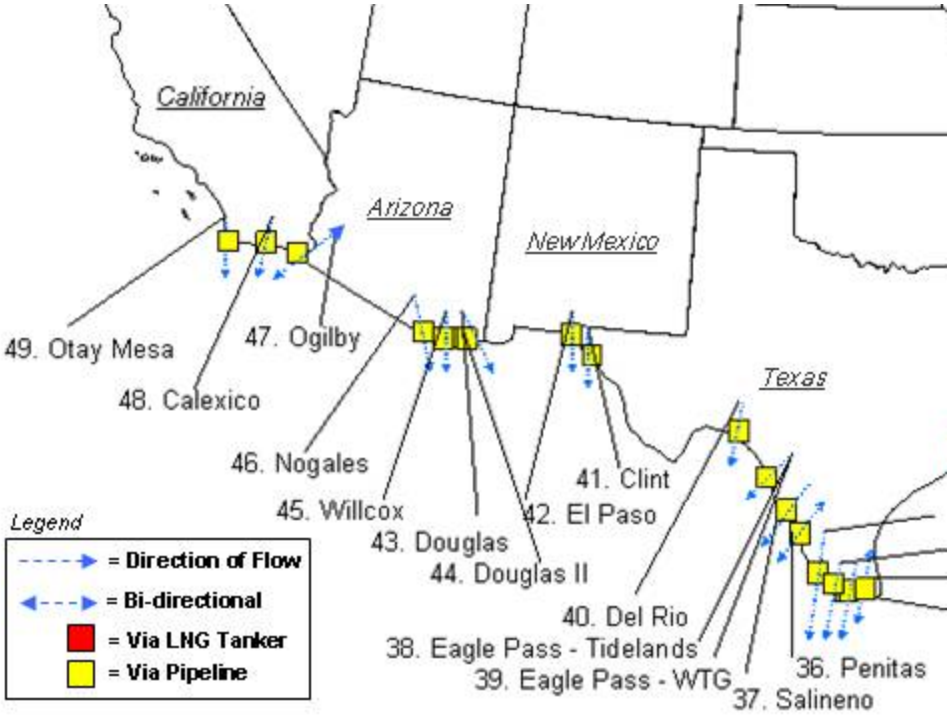
Exports to Mexico

- As of 2008, US export capacity to Mexico was 3.6 Bcf/d.
- Over a dozen total pipeline interconnects exist between US- Mexico.
- Majority of volumes transported via half-dozen meter points.



Source: Energy Information Agency

Export to Mexico – Growth Expected

- Mexican legislature passed landmark legislation in Dec 2013 to liberalize its energy markets.
- CFE, Mexico's largest power producer to reduce its use of oil (fuel oil and diesel) for power generation by 90% by 2017 as compared to 2012. That is the equivalent of 800 MMcf/d of natural gas. They have already achieved about half of this goal.
- There are 2.7 GW (as of 3/15) of new renewable generation in the works: 8 wind farms, 5 geo-thermal, 2 hydro, so renewables could fill 100-200 MMcfd of the need.
- There are 8 GW of gas-fired generation capacity in development between now and the end of 2018.
- We believe 5 Bcf/d of additional US to Mexico gas pipelines could be built within next 3 years, which could double US Exports to 4.5 Bcfd.
- Already in Dec 2014 a major pipeline NET Mexico (2.1 Bcfd capacity) went into service Los Ramones project. Upwards of 0.5 Bcf are flowing cross border from Texas. However, only half of those flows are visible via the Interstate Pipeline System.
- Mexican LNG Import facilities will be displaced by US Gas. Altamira and Manzanillo import facilities.

US LNG Export Future

- As of March 4, FERC has approved 5 LNG export projects, all of which are under construction:
  - Cheniere's Sabine Pass LNG (2.76 Bcfd), FERC just few days approved expansion to 4.14 Bcfd
  - Sempra Cameron LNG (1.7 Bcfd)
  - Freeport LNG and FLNG expansion (1. 8 Bcfd)
  - Dominion's Cove Point LNG (0.8 Bcfd)
  - Cheniere's Corpus Christi (2.14 Bcfd)
- Total: 9.2 Bcfd without Sabine Pass Expansion (65 Million metric tons/year), that would represent about 25% of Current Global LNG Trade (237 Million MT in 2013, about the same as 2012).
- Opponents: petro-chemical and other industrials who recently revamped US operations due to lower US gas price; lawmakers sensitive to the energy security

Sources: Reuters, WSJ, FGE

Costs of LNG Exports: A Look at Sabine Pass

- Will it be economical to ship LNG from US (Gulf) to Asia?
- Cheniere Energy's analysis indicates US LNG costs of $7-10/MMBtu as compared to Oil-indexed LNG prices below.

	Oil-Indexed Contract Price	
Indexation	11%	15%
at $50/bbl	$5.50	$7.50
at $100/bbl	$11.00	$15.00
at $150/bbl	$16.50	$22.50

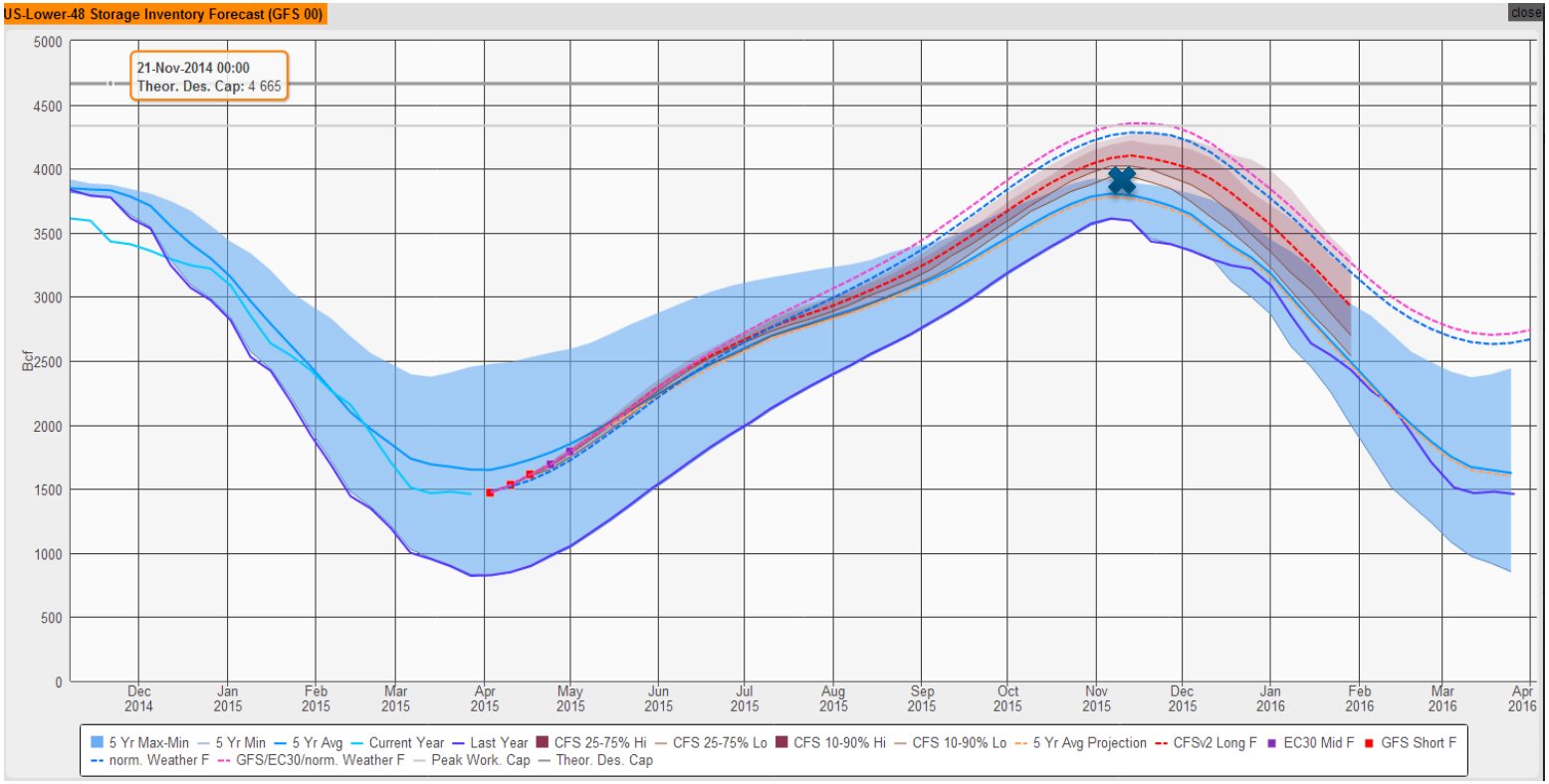
($/MMBtu)	Americas	Europe	Asia
Henry Hub	$3.00	$3.00	$3.00
Capacity Charge	3.00	3.00	3.00
Shipping	0.75	1.25	3
Fuel/Basis	0.35	0.35	0.35
Delivered Cost	**$7.10**	**$7.60**	**$9.35**

Sources: Cheniere Energy

Low Oil Price Impact on US LNG Export Plans

- US LNG export projects that have not yet taken FID and/or have not signed contracts with buyers may be threatened by low oil prices.
- With prospects of very low oil prices, potential buyers may not be willing to sign up for US contracts as they can get cheaper oil indexed LNG.
- All of the US contracts are indexed on Henry Hub. In the case of Sabine Pass, buyers are paying in the region of $3/MMBtu for liquefaction and 115% of HH + shipping costs.
- Cheniere is offering take or pay contracts with $3/MMBtu (liquefaction cost) as deferral price; buyers have to pay this “fee” irrespective of using the capacity.
- Most of the other projects have tolling contracts where the buyers have to pay the liquefaction. If they use the capacity they have booked, they have to pay 15% on top of HH for variable costs.
- Buyers are taking the entire price risk. Owners/operators of the export plants are taking the operational risk at the liquefaction plant.

Short-Term Forecast



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Sources: TR NG R&F

Price Outlook

- According to our modeling the market will need to absorb 300 Bcf of supply in order to enter Winter at 4.0 Tcf or below – which we view a key price signal.
- Flexible fuel switching will once again through its price mechanism need to balance the market.

CURRENT FORWARD PRICES AND ESTIMATED FORWARD PRICES REQUIRED TO REACH TARGET INVENTORY

	May 15	Jun 15	Jul 15	Aug 15	Sep 15	Oct 15	Nov 15
Forward Prices Last Close							
NYMEX Henry Hub Natural Gas	2.680	2.725	2.786	2.815	2.817	2.843	2.951
CAPP Coal Futures	51.20	50.67	49.30	49.30	49.30	49.00	49.00
Western Rail PRB Coal Swap	10.23	10.28	10.23	10.23	10.23	10.37	10.37
Modelled Natural Gas Prices							
30 Day Forecast/Normal Weather							
Base Scenario	2.31	2.35	2.40	2.42	2.42	2.45	2.54
Scenario +1 Bcf/d looser balance	2.07	2.10	2.15	2.17	2.17	2.20	2.28
Scenario -1 Bcf/d tighter balance	2.57	2.62	2.68	2.70	2.71	2.73	2.84
30 Day Forecast/CFSv2							
Base Scenario	2.63	2.67	2.73	2.76	2.76	2.79	2.89
Normal Weather							
Base Scenario	2.40	2.44	2.50	2.52	2.52	2.55	2.64

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US Gas Market Review

- Market mechanisms worked 2011/13 – market is in a constant state of balancing itself.
- Supply-Demand dislocations between NE-SE-MW-Rockies-Pacific NW will create Basis volatility.
- Associated gas declines based on crude/NGL directed E&P will tighten the market in 2016.
- There are over 2,000 Tcf of deemed recoverable reserves, but how much will natural gas costs in Rounds 2, 3…of shale gas E&P; some speculate as much as $7-8/MMBtu.
- Current prices are somewhat high; in order to enter winter season below 4.0 Tcf and not push capacity limits.
- Re-balancing cycles which involves periods of both high/low volatility are here to stay.

Sources: TR NG R&F Potential Gas Committee

Data Availability:

an Analyst’s Perspective

Impact of FERC Rules on Data Availability

- 2000: ***FERC Order 637*** – "Minor" ruling that mandated inter-state pipeline companies to share daily flow nomination data to facilitate price transparency.
  - Entrepreneurial company (Bentek) takes advantage of opportunity
  - Bentek collects, categorizes and disseminates daily supply/demand data to industry players, creating daily up-to-date (thru Day-Ahead Gas Day)
  - Gap in coverage (see next slide): only inter-state pipeline nominations covered
    - Roughly 50-60% of flows are "visible"
    - Use of scale-up models necessary to estimate missing gap;
    - Model error ever-present; especially weekly storage (model)
- 2008: ***FERC Order 720*** – Mandates that intra-state pipeline companies also to share daily flow nomination data.
  - Attempt to address in gap in coverage
  - Lobbying arm of Texas pipeline companies takes FERC to court and wins
  - Gap in coverage persists; modeling still necessary and error-prone.

Daily Interstate Pipeline Flows: Gaps in Coverage

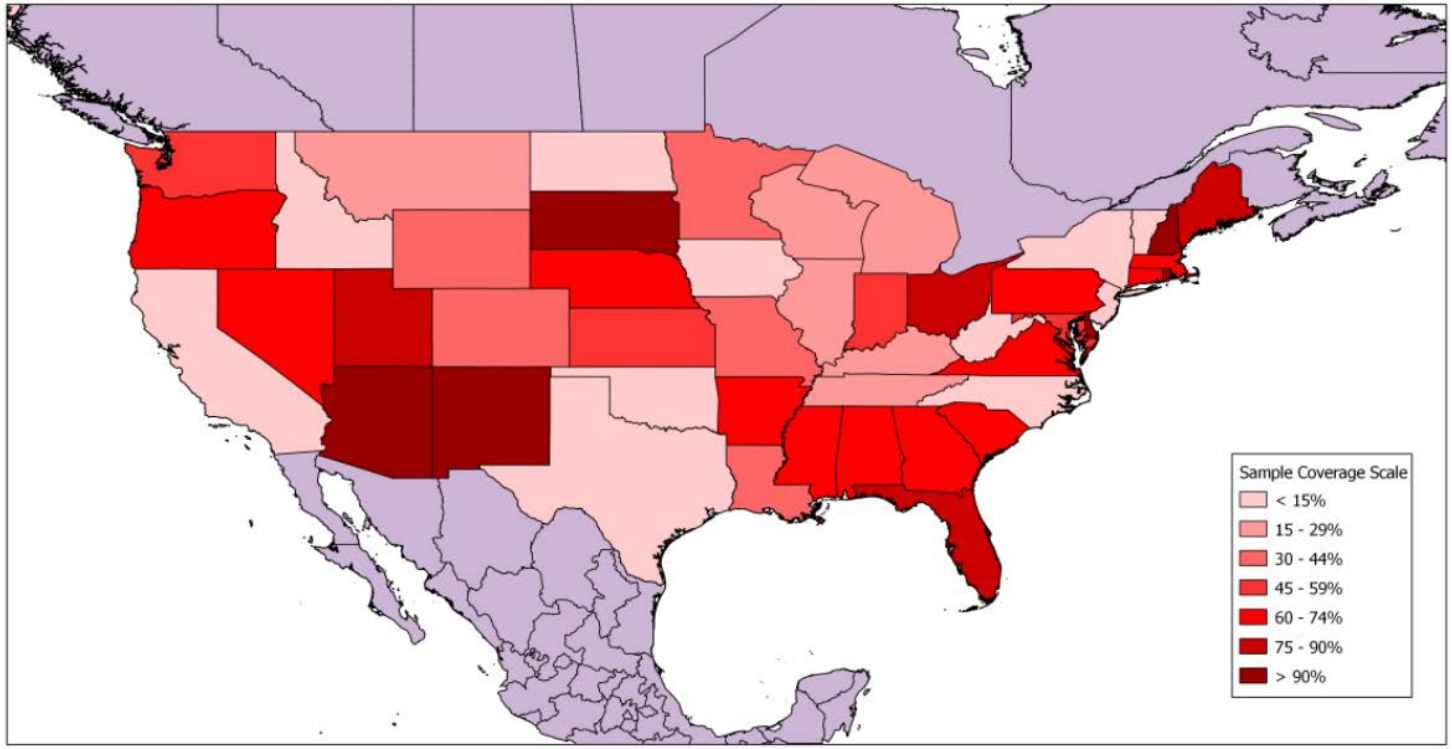
- Using pipeline nominations improved timeliness and frequency of supply/demand information from monthly/3 month lagged to daily/current Gas Day
- However, solely relying on interstate pipelines is insufficient to assessing daily S/D as the coverage is incomplete because there is No Intra-state pipeline data.

	Sample Coverage Per Region (Jan2010 - Dec2012)			
	Gas-For-Power	Industrial	ResComm	Production
Northeast	60%	17%	48%	
Southeast	73%	24%	56%	
Midwest	44%	15%	38%	
Central	50%	30%	15%	
Southwest	21%	3%	62%	
West	44%	62%	20%	
US-Lower48	49%	32%	38%	63%

Source: Thomson R&F

Interstate Pipeline Coverage: Gas-to-Power Demand

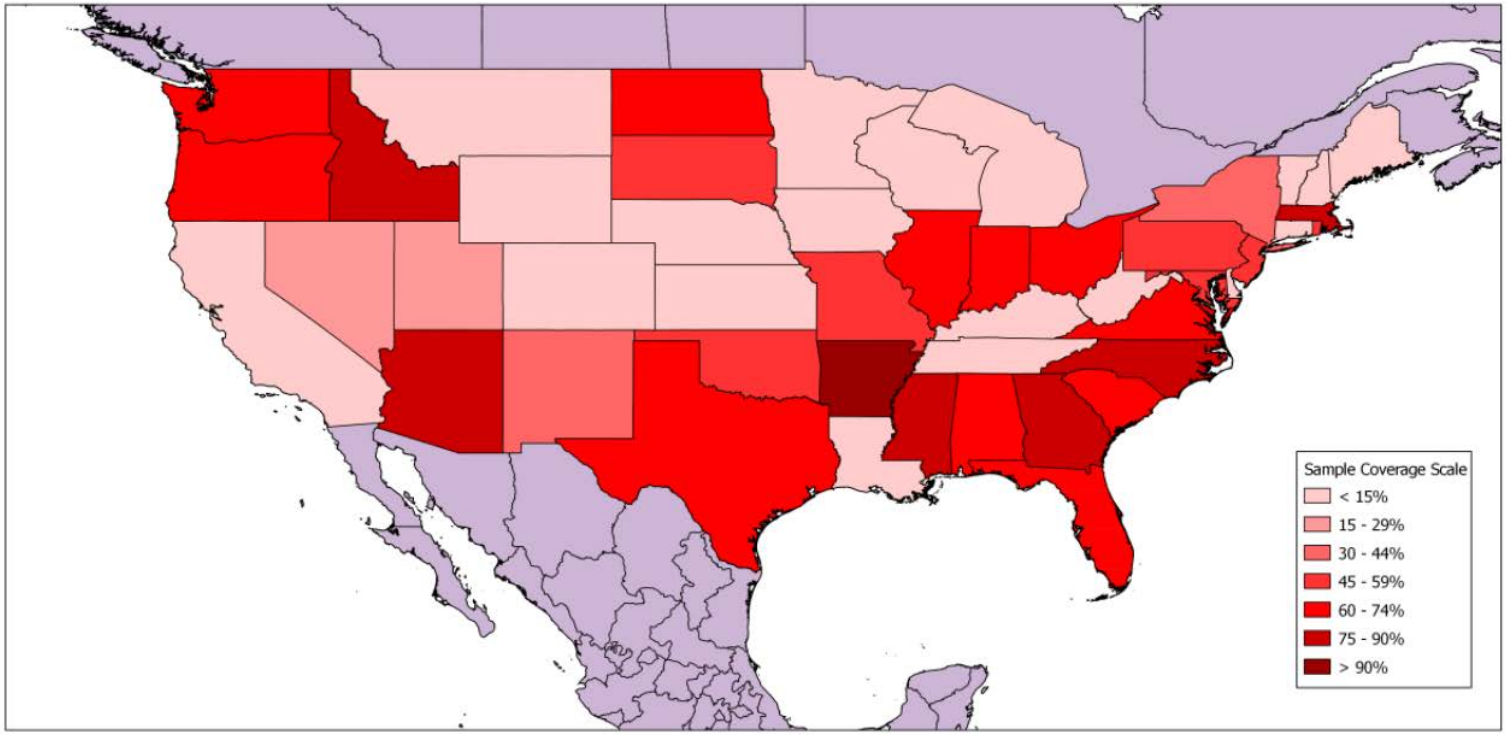
Gas-for-power sample coverage



Sources: Thomson Reuters R&F

Interstate Pipeline Coverage: Residential/Commercial Demand

Residential/Commercial sample coverage



Sources: Thomson Reuters R&F

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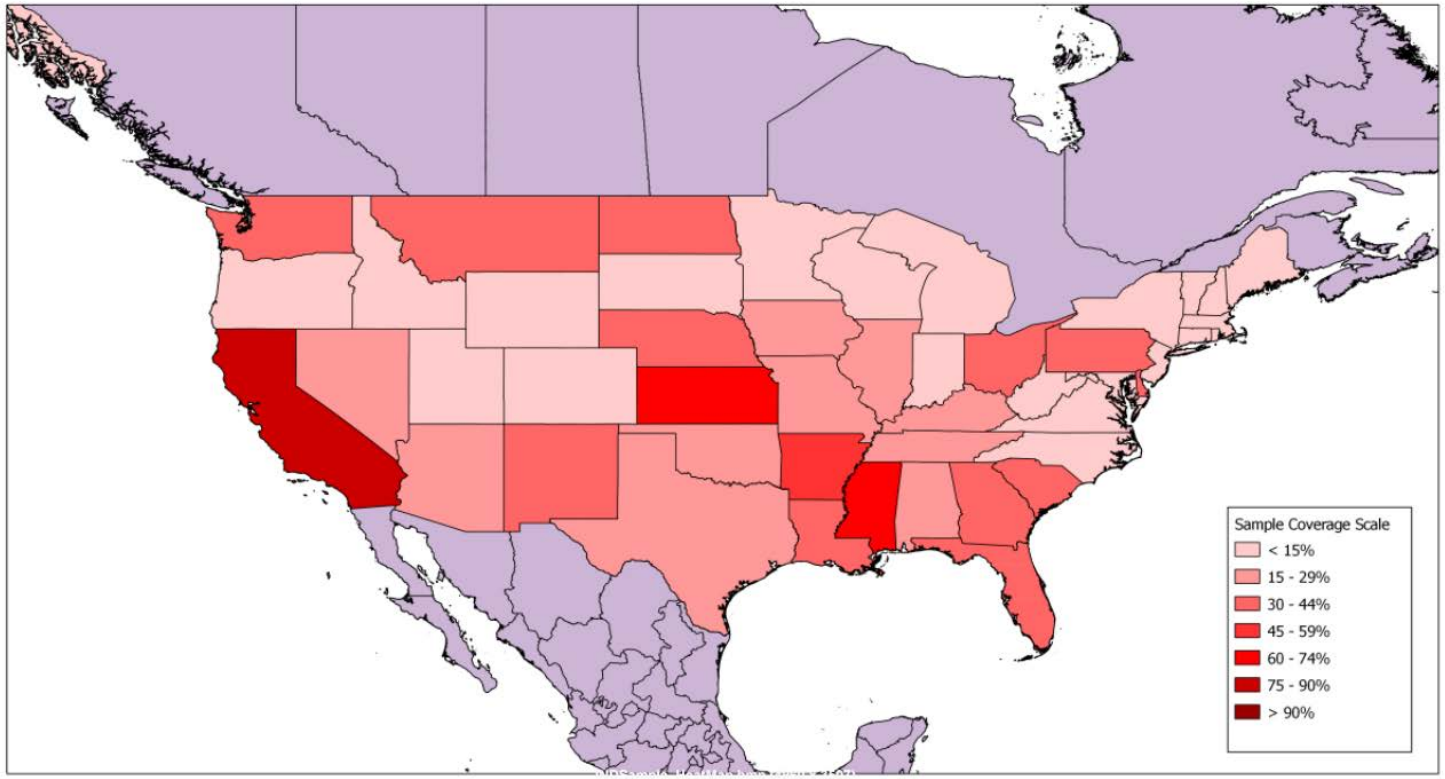
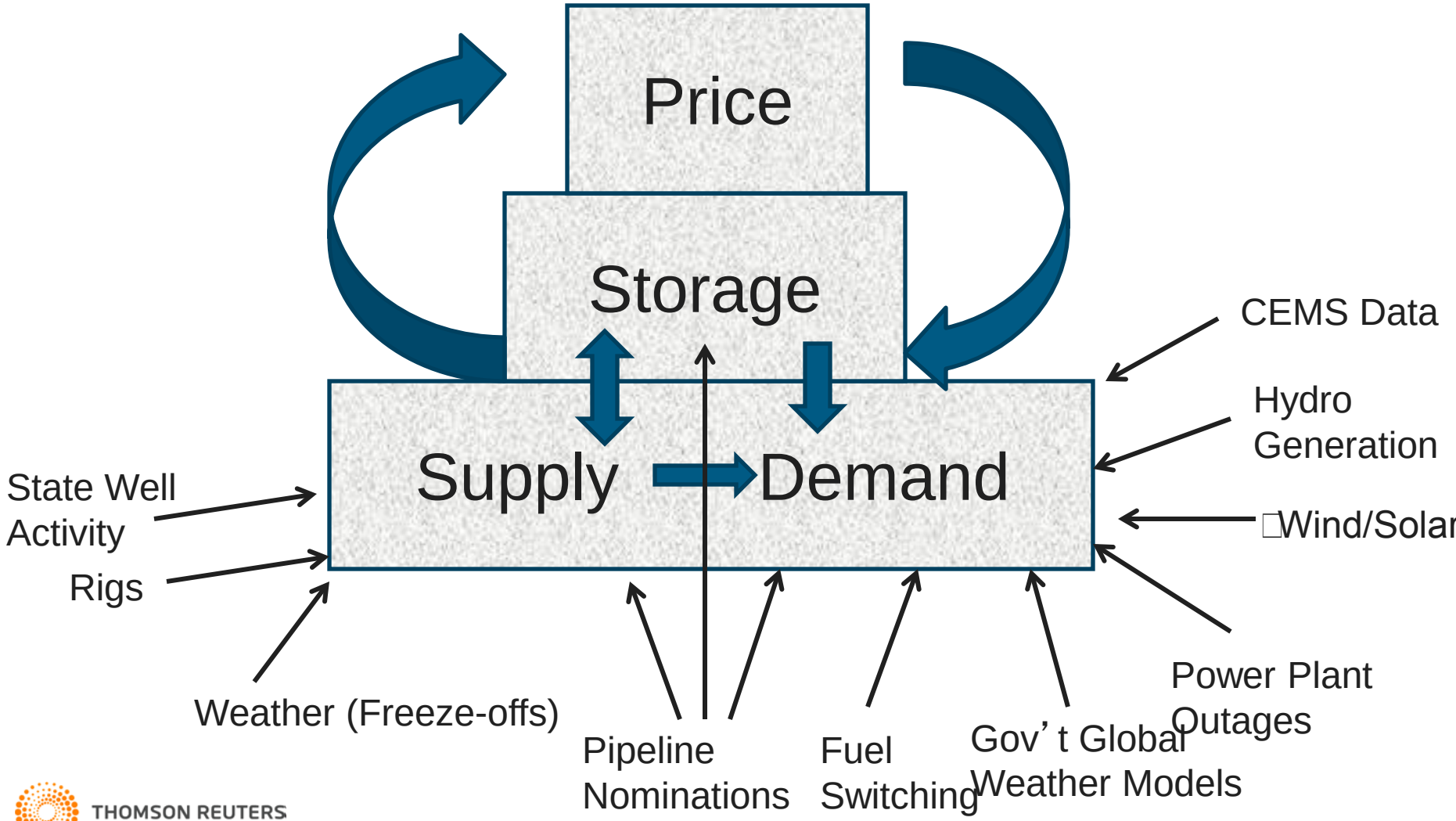
Interstate Pipeline Coverage: Industrial Demand

Industrial sample coverage

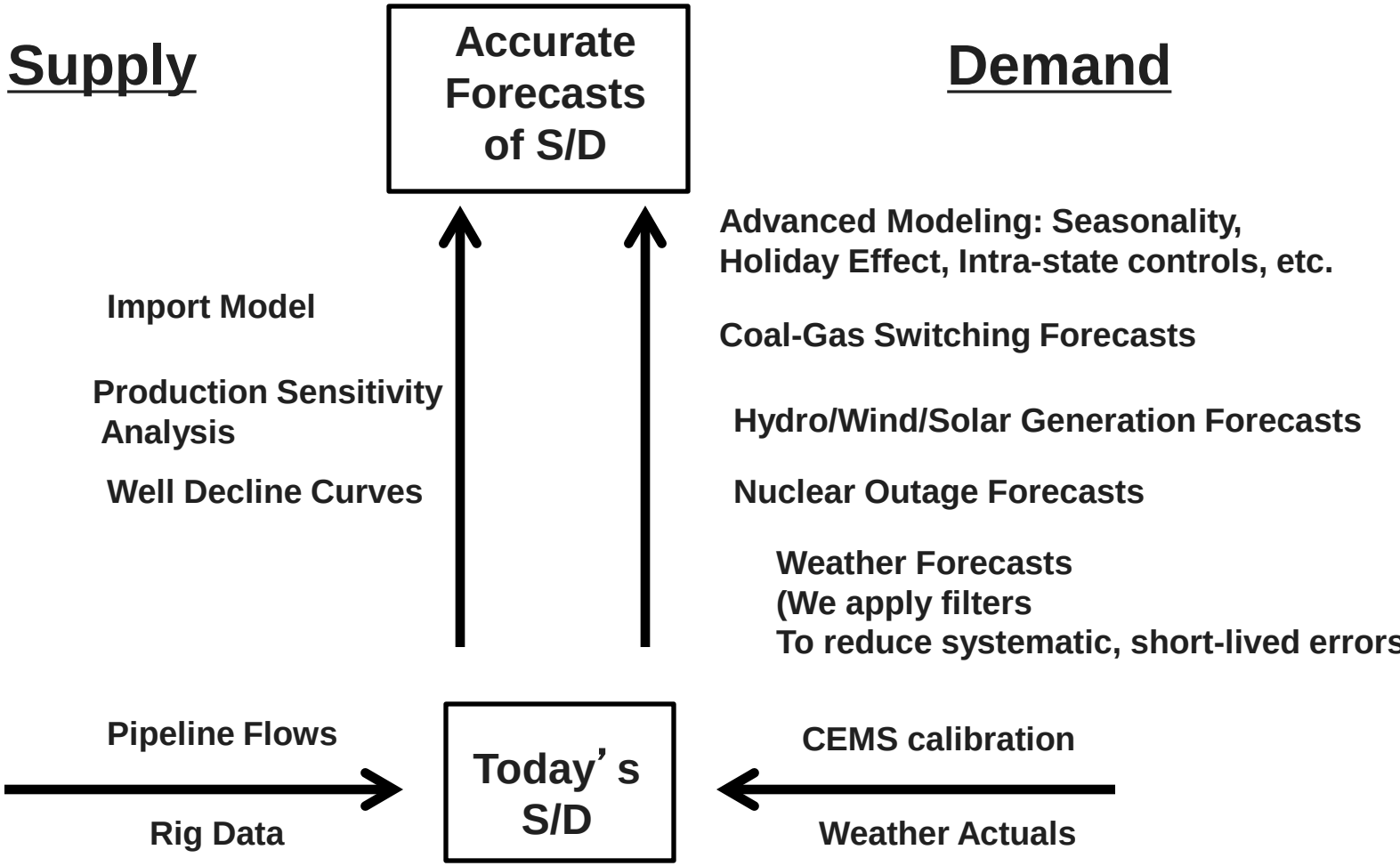


Sources: Thomson Reuters R&F

Supply-Demand Fundamentals: An Integrated Approach



Supply-Demand Forecasting: Dynamic, Real-time Modeling



Our Data Sources, Inputs to Models

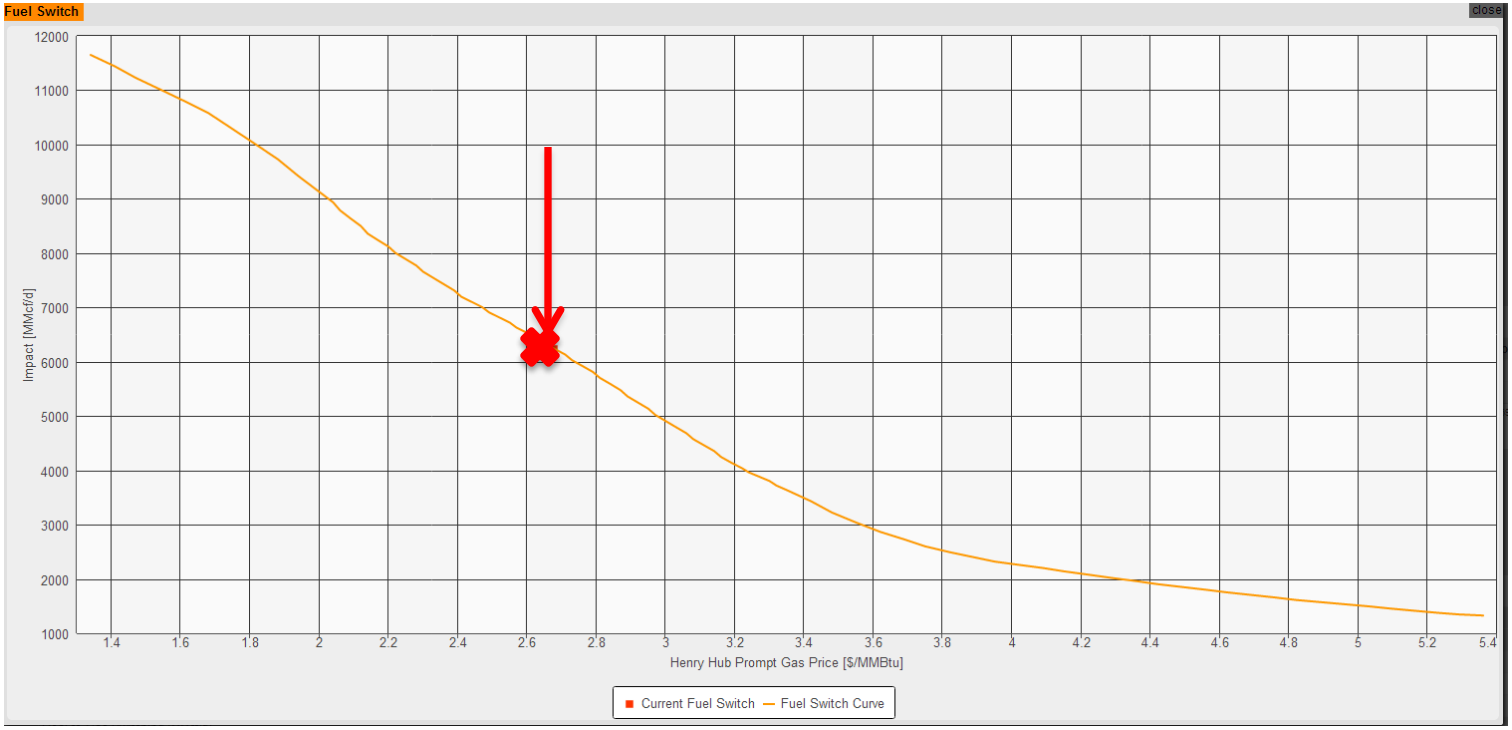
- **EIA** – Fed Gov't, Monthly Supply/Demand, Weekly Storage
- **EPA** - Fed Gov't Power Gen, Lagged, complete
- **Global Weather Models** –Real-time translation of gridbased forecasts into demand/storage foreacsts
  - GFS/ECMWF, 15 day, 6x/Day
  - ECMWF, 30 day, 2x/week
  - CFSv2, 9 month 1x/day
- **9 Independent System Operators (ISOs)** – Reliability Entities, Real-time Power Gen
- **Industrial Information Resources** – Private Vendor, Surveys Futures Power Plant Outages, Infrastructure Projects
- **Hart Energy** – GIS data of oil/gas infrastruture
- **AIS** – Global vessel tracking, LNG
- **NRC** – Fed Gov't, Actual Nuclear Plant Outages
- **BSEE** – Fed Gov't, federal offshore production
- **State Mineral Rights Agencies** – Local gov't, well-head level production
- **CME**
- **ICE**
- **Baker Hughes**
- **PointLogic** –meter-level (20,000) pipeline flow data updated 6x/day, production forecasts

Gas-to-Power Model: Multiple Impact Factors

- **Residential/Commercial/Industrial Models**
  - Uses temperature forecasts with various cutoffs per state as model inputs; captures regional efficiency differences
  - Incorporates seasonality ramping up/down in shoulder seasons; non-linear effects over extreme cold temperatures.
- **Gas-to-Power Model**
  - Uses a dozen individual impact factors
  - uses EPA CEMS data for fine-tuned calibration
  - daily adjustments based on pipeline flow nominations
  - State-level econometric models adjusts for nuclear outages, coal-gas switching, hydro generation
  - Coal-gas switching based on relationship of coal:gas prompt month prices with observed power plant generation
  - Incorporates specific holiday, weekend effects

Coal-Gas Switching: Critical in estimating Demand and Forecasting Inventories

- It is THE flexible element that allows for the market to balance itself in relative short order. This price elasticity is captured in the econometric Gas-to-Power model and improves the accuracy over a simple Stack Model.



US Dry Production Forecast

- Over the short-term production displays weak price response; our short-term models generally use a flat-line assumption.
- Over longer than 1 year time horizon, one needs a good forecast.
- Post-Shale drilling revolution: old models not as reliable; disrupted by high productivity of newer drilling techniques as well the growth of associated gas.
- State mineral rights agencies show more detailed production: well-head production. This data is not collected and disseminated by the federal government.
- Everyone monitoring impact of >$4/MMBtu gas on completed/"tied-in" wells on production – will the spigots be turned on? And if so, how long will it take to go through the exisitng inventory before a costlier dry gas drilling commences?

Production Forecast

- Developing well productivity profiles per geologic play that reflect productivity characteristics in various regions.
- Then using rig counts per region, one can more reliably forecast.
- This method is still vulnerable to growth, driven by associated/"wet" gas which is disconnected from both natural gas prices as well as dry gas rig count.
- We employ well profiles combined with assumptions for rig counts growth to forecast production 5-years ahead.
- Their current forecast calls for Lower-48 production to grow over 2015 at 3.3 Bcfd at 73.3 Bcf/d, then start to decline in Q4 and into 2016 as the result of lower associated gas and rig counts.

Source: PointLogic Energy

Forecasting the EIA Storage Report

- A cottage industry has grown around forecasting the EIA Storage Number.
- Using purely daily nominations used to be best-of-class method.
- We have hybrid approach, blending the pure Flow model with a S/D Balance model that incorporates multiple demand impact factors, including weather, outages, hydro generation, nuclear outage.
- Thomson Reuters R&F group placed third out of 40 forecasters (includes polls, bank analysts, consultancies)
- A Mean Absolute Error of 5 Bcf is considered outstanding and at top of forecasting leagues. Weekly average report change over a year is 77 Bcf, so MAE of 5 Bcf is 6.5% error.

Source: Energy Metro Desk

Balancing Item: Reconciling EIA's Weekly Storage Number

- EIA's weekly storage assessment is a model itself; vulnerable to sampling/reporting errors.
- Not all revisions are reported publicly (< 7 Bcf); "true-ups and true downs" are suspected by market participants; but EIA says they are extremely rare.
- Our current balancing item captures systematic errors; currently at ~ +6 Bcf/week.
- Balancing Item Displays some seasonality which we try to anticipate.
- Model filter reacts conservatively to weekly misses.

Prognosticating Beyond 1 Year

- Beyond 1 year forecast timeframe, it becomes much less a modeling task and more of an "analyst's touch" effort.
- There are many opinions out there; we are agnostic – we listen to all, and like you, judge based on which series of facts/arguments seems most plausible.
- We give more weight to analysts who have been right in their respective area of prognostication.
- Next we highlight several long-term forecasts we are watching closely.

Our S/D Balance Table

STORAGE FORECAST - S/D BALANCE METHOD

	Mar 27 2015	Mar 28 2015	Mar 29 2015	Mar 30 2015	Mar 31 2015	Apr 01 2015	Apr 02 2015	Total
MMcf/d								
Supply								
Dry Production	73 912	73 809	73 632	73 784	73 562	73 008	72 791	
Imports-Canada	8 313	8 159	8 049	8 086	8 248	7 693	7 093	
LNG Sendout	275	275	275	275	273	354	366	
Total Supply	82 500	82 242	81 956	82 146	82 083	81 055	80 251	572 232
Demand								
Exports-Canada	2 410	2 405	2 361	2 330	2 326	1 688	1 635	
Exports-Mexico	1 992	1 850	1 897	1 896	1 956	1 889	1 835	
Commercial	12 858	12 507	10 317	8 721	9 096	8 428	7 309	
Power Plant	23 166	19 588	18 960	21 780	22 014	22 630	22 178	
Industrial	22 490	21 896	21 108	20 817	20 942	20 576	20 450	
Residential	20 887	20 660	16 255	12 158	13 050	11 563	9 369	
Plant Fuel	4 509	4 502	4 492	4 501	4 487	4 453	4 440	
Pipe Distribution	2 867	2 704	2 430	2 323	2 378	2 312	2 178	
Vehicle Fuel	90	90	90	90	90	90	90	
Total Consumption	86 867	81 948	73 651	70 389	72 057	70 052	66 014	
Total Demand	91 268	86 202	77 910	74 616	76 339	73 629	69 484	549 448
Daily Imbalance								
Implied Storage (Net Injection)	-8 768	-3 960	4 046	7 530	5 744	7 425	10 766	22 783
Balancing Item	856	856	856	856	856	856	856	5 990
Adjusted Implied Storage (Net Injection)	-7 913	-3 104	4 902	8 386	6 600	8 281	11 622	28 773
Flow & Blended Model								
Flow Storage Model	-3 396	-3 626	-1 962	-391	1 057	5 132	7 143	3 957
Blended Storage Model	-4 525	-3 496	-246	1 803	2 443	5 919	8 263	10 161
Weather Adjusted Daily Imbalance								
Adjusted Implied Storage (Net Injection)	210	6 521	6 552	1 669	2 426	2 069	2 244	21 692

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THOMSON REUTERS

US Natural Gas Data Takeaways

EIA Storage Report: The High-frequency, Market-moving Number

- Weekly estimates of working gas in storage were first provided by the American Gas Association (AGA) in 1994, but ended in 2001.
- US Energy Information Agency (EIA) started publishing the reports in 2002.
- The EIA Storage report is an **estimate of** weekly inventory stocks by 3 major regions, and 2 types (Salt and Non-Salt field).

- Market participants concerned about EIA's sampling methods, revision policy, and discrepancy between weekly and monthly reports.
- Moves markets every Thursday at 1030 AM ET analysts/traders use it as high-frequency and official representation of the tightening/ weekly balance. Reconcile against their own balance.

Source: Energy Information Agency (EIA)

Food for Thought #1: “Higher Frequency” US Weekly Storage Number

- Analysts: careful what you wish for! Higher frequency numbers at the expense of accuracy can introduce unintended problems…
  - Artificial volatility in the market; often times volatility that appear for minutes or seconds and then disappear.
  - But just enough to produce damage in the form of stop-loss triggers, option triggers
  - Creates a self-perpetuating cycling of market wanting more granular data which is turn starts a cycle of using higher frequency, lower quality data.

EIA Storage Report Moves Market Every Thurs

Sources: CME, Thomson Reuters

THOMSON REUTERS

Food for Thought #2: Residential/Commercial Billing Cycle Issue

- EIA's survey of utilities' monthly bills in order to estimate residential and commercial natural gas demand created a "billing cycle" mismatch between when the service was billed for and when the demand actually occurred
- Despite acknowledging the problem and attempting to correct this problem, we still can systematically improve our mode.

Food for Thought #3: Associated Gas Definition

- The ability to estimate actual and then model, and forecast Associated Natural Gas production has been very important in the US given the massive confluence of Oil, NGLs, and Natural Gas within certain basins.
- Associated Gas accounts for 47-55% of total US Gas production.
- The lack of precision comes down to differences in definitions by different analysts on what contitues associated gas.
- EIA defines “associated” natural gas as the “combined volume of natural gas that occurs in crude oil reservoirs either as free gas or as gas on solution with crude oil (dissolved). Per this definition associated gas would account for ~16% of total gas production which most would agree is an under-estimate.
- Along the same lines, EIA has made a valiant attempt at revising definitions for NGLs; this would be a useful exercise for JODI as well as it ties into more precisely measuring/definiing Associated Gas volumes.

Food for Thought #4: Retrospective Revisions, Production Example

- Last month, the Dec. 2014 Production numbers were released. Originally our estimate was only 0.1 Bcfd off – we were happy!
- Then the January the number was released a couple weeks ago, along with it the December production number increased 0.6 Bcfd with no explanation alongside the January monthly report.
- This type of backward-looking revision is common, but the market does not take note of it well. Retrospective revisions are an important part of data dissemination, but requires careful explanations, which JODI DB may not handle. Communication is key here!

Food For Thought #5: Rig Counts and Wellhead level Data

- Rig counts provide useful insight into production trends, but no longer can be relied upon to forecast short-term trends.
- Efficiencies of unconventional drilling disrupt old rig count to production volume relationship.
- For example, natural gas-direct rigs have fallen from 811 to 222 (-73%) since Jan 2012, whereas production is flat over same period.
- Analysts have turned to state wellhead levels data in order to improve their model, creating well decline profiles.
- However, will wellhead level data be reported to JODI, and if so will US use federal and state data?

Food for Thought #6: Data Collector and Analyst Cooperation

- EIA has been very open in working with and getting feedback from Analysts.
- For example, they have an ongoing series of catch-up calls regarding ways to improve the utility of the weekly storage numbers.
- Complaints about the lack of transparency and granularity in the 'Other State's category of EIA's production, let to new *Oil & Gas Productivity Report* that now does what industry analysts were doing on their own – estimate with more granularity and timeliness production developments.
- Should JODI collect and disseminate a member country's "modeled" data?
- And yet, despite this good faith effort, disagreements continue to persist.

US Natural Gas Data Takeaways

- As US market was de-regulated, it created multiple disparate entities for sources of data; complicating data collection, uniformity, and standards. This created opportunity for entrepreneurial companies to fill data gap.
- Government agencies do a good job collecting/disseminating monthly data and still serve as benchmark for market participants; but suffer from lack of granularity, timeliness, and completeness which all impact analysis and forecasting of fundamentals.
- Gaps have been filled in the US by analysts with a multitude of proxy data to estimate what analysts really want: accurate, complete actuals!

Data Czar Wishlist:

1.) Intra-state pipeline flows would give us better view of production.

2.) Weekly storage survey could be a true weekly change, not estimate of absolute levels which have errors built within.

Source: www.naturalgas.org

Thank you!