RiskCentrix, LLC
Clarity in a World of Uncertainty

A Strawman for a Risk Management Regulatory Framework

Regulatory Hedge Workshop
March 2016

Presented by Mike Gettings, RiskCentrix
gettingsm@riskcentrix.com

1

RiskCentrix, LLC
Clarity in a World of Uncertainty

Todays Goals

Review Principles of Active Risk Management

Present a Draft Regulatory Framework to . . .

- Encourage more active "monitor-and-respond" price-risk management
- Provide more clarity as to prudence criteria
  - By defining terms and specifying critical parameters for risk measurement
  - By defining a framework for strategy development

2

Review of Concepts

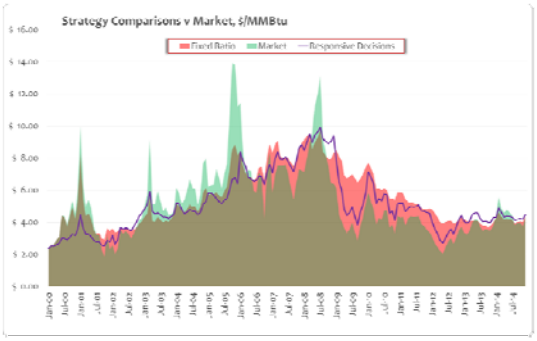
RiskCentrix, LLC
Clarity in a World of Uncertainty

Why is This Important?

RiskCentrix, LLC
Clarity in a World of Uncertainty

It's important because risk-responsive hedging produces results more compatible with customers' risk appetite, but deployment depends on a workable regulatory compact.

This graphic, excerpted from the white paper, illustrates the benefits in terms of gas costs and hedge losses.



Illustrative strategies are described in the Appendix

4

Principle Points – Part 1
Hedging Strategies

RiskCentrix, LLC
Clarity in a World of Uncertainty

- Risk is polar: up-market cost exposures and down-market hedge loss potential
  - Hedging does not eliminate risk; it shapes it differently
  - Every hedge carries a risk of loss. Not hedging carries risk of cost increases. Those risks should be assessed.
  - Upside risk could produce higher customer bills; downside risk could produce lost opportunity, but customer bills are still lower than prior expectations.
    - So customers' marginal utility favors hedging.
- Build risk management decisions on a quantified RISK view!
  - A locked, fixed ratio will produce random outcomes that could be intolerable in either direction.
- Objectives (i.e., risk tolerances) should drive strategy, and like everything else, diligent management is superior to a one-time assessment

5

Principle Points – Part 1 Conclusion
Hedging Strategies

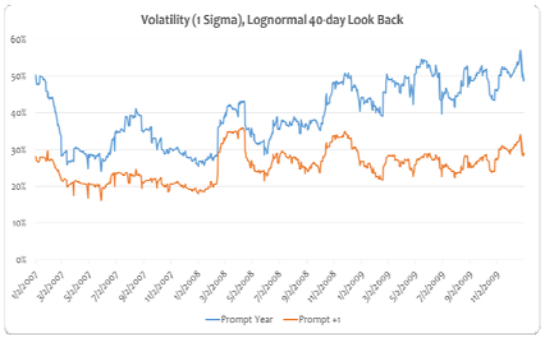
RiskCentrix, LLC
Clarity in a World of Uncertainty

To produce high confidence in tolerable outcomes, hedge managers must monitor risk & deploy risk-responsive hedge decisions.

- Diligent risk measurements require quantitative finance methods
- Strategy development (i.e., planning for risk responses) requires an understanding of potential risk environments. Simulations are useful.

It's not just price volatility,

volatility itself varies continuously



6

Principle Points – Part 2
Regulatory Implications

RiskCentrix, LLC
Clarity in a World of Uncertainty

- Market risk carries regulatory risk which is also polar . . .
  - Inadequate hedges could result in inappropriate cost increases and possible disallowance
  - Large hedge losses could result in prudence questions and possible disallowance
- In the absence of a regulatory "compact" active decisions can carry greater liability than passive ones, so LDCs tend to favor the simplest methods.
  - And complex decisions raise bigger questions unless a regulatory understanding pre-exists

7

Principle Points – Part 2 Objectives
Regulatory Implications

RiskCentrix, LLC
Clarity in a World of Uncertainty

So our goal is to create a regulatory environment, that enables more sophisticated hedging programs by . . .

- Establishing language for communicating risk-responsive hedge strategies and decision support;
- Establishing a process for strategy development, and regulatory review and acknowledgment;
- Developing a framework of reasonable criteria for prudence assessments;
- Defining reporting templates to demonstrate diligent execution of strategies;
- Finding a practical path whereby each LDC can move from its current state to a quantitative finance approach.

8

Excerpts from 2014 Workshop

➡ Or skip to Regulatory Strawman

RiskCentrix, LLC
Clarity in a World of Uncertainty

First . . . A Useful Framework Setting Objectives

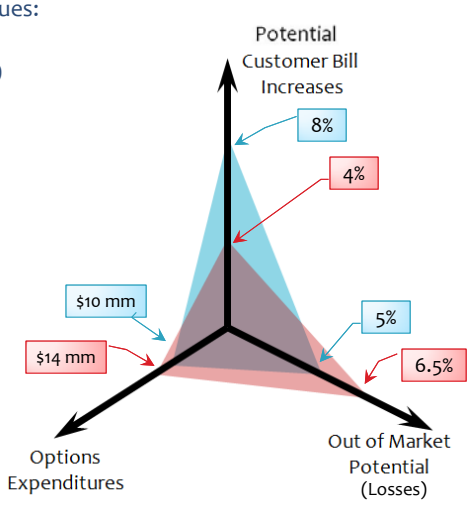
RiskCentrix, LLC
Clarity in a World of Uncertainty

Objectives must balance 3 competing Issues:

- Customer Bill Increase Tolerance
- Out of Market Tolerance (Losses/Collateral)
- Option Expenditures

- The Blue and Red Triangles (right) are alternative sets of tolerances for an assumed volatility level.

Note that the higher the design volatility, the larger the triangle must be!



10

. . . A Useful Framework
Hedge Decision Types

RiskCentrix, LLC
Clarity in a World of Uncertainty

A Menu of Hedge Decision Types . . .

- **Defensive Hedges**
  - Hedge when necessary to defend upside cost tolerance given 'forward price + risk' metrics
- **Programmatic Hedges**
  - Early gradual accumulation to pre-mitigate net exposures to a level manageable via Defensive Hedge Rules
- **Discretionary Hedges**
  - Hedge in modest increments when prices offer target values consistent with goals
- **Contingency Plans**
  - When extreme circumstances arise, how will decisions be modified to constrain hedge losses?

The best programs use 3, maybe 4 types

Defensive Hedges utilize quantitative finance methodologies

Many regulated utilities' hedge programs do only this.

These are more about opportunity management than risk management

Seldom need to be deployed; standby to constrain losses in collapsing markets

11

Properties of Futures Prices

RiskCentrix, LLC
Clarity in a World of Uncertainty

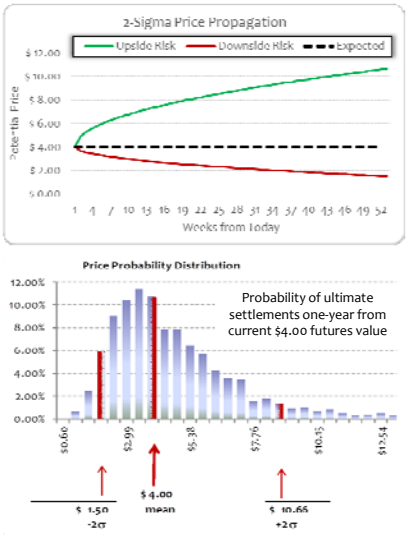
The NYMEX futures price for a given forward contract month reflects the money-backed consensus of all market participants as to the "mean expectation" of the future cost of gas, but it is transient. It can change with each trade.

Volatility can be measured empirically based on daily price changes over a statistically valid period like 30+ days.

A risk envelope of potential ultimate settlement values *or interim future hedge opportunities* can be determined based on daily volatility propagated over the time to settlement (Top graph).

The second graph shows the potential probability distribution one year from now at 2 sigma.

(2 sigma means all but 2.3% of potential outcomes on the top and 2.3% on the bottom)

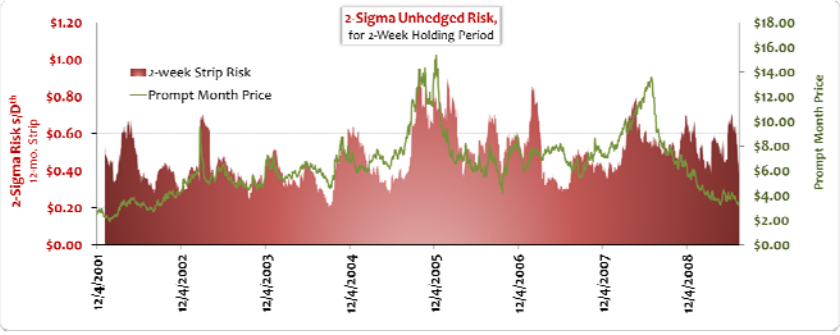


12

Volatility & Risk Are Anything But Static Risk Must Be Monitored

RiskCentrix, LLC
Clarity in a World of Uncertainty

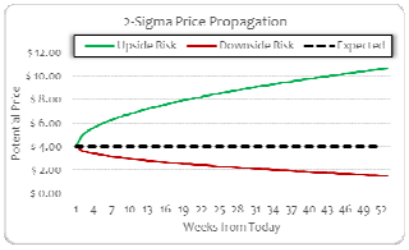
The 2-sigma upside risk, as presented here in red, indicates the potential upside price risk in $/Dth that would only be exceeded 2.3% of the time within 2 weeks .

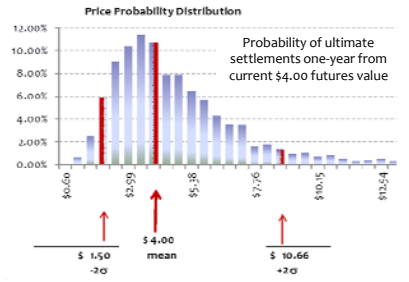


In conjunction with early emergence of price increases, 2-sigma risk will warn of forward price spikes, but it must be monitored.

More on Properties of Futures Prices

RiskCentrix, LLC
Clarity in a World of Uncertainty





Note:

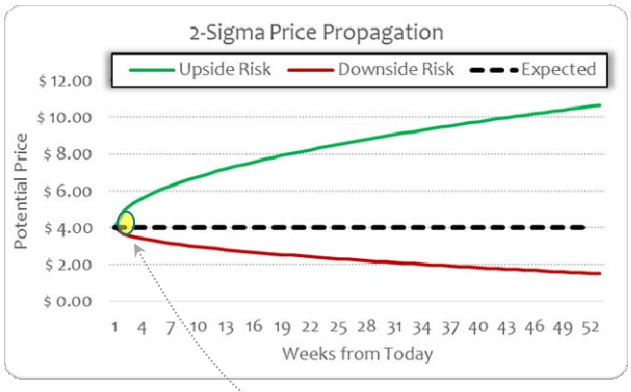
- Upside extreme outcomes are far greater in magnitude than downside extremes because prices are constrained to no less than zero on the downside. (Log normally distributed)
- The risk is proportionate to the square root of the time it accumulates. This will facilitate management by "holding period."

And . . .

- Since the probability-weighted expected value is the mean of the distribution, the most likely outcomes fall on the downside which counterbalances the greater magnitude of potential upside price movements.

So What?

RiskCentrix, LLC
Clarity in a World of Uncertainty



Why would anyone try to make one annual decision to manage this?

A full year's risk span

When a two-week horizon & hedge review (holding period) allows them to manage much smaller risk increments

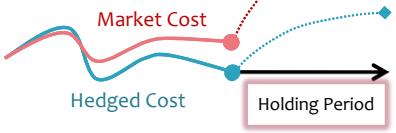
Volatility Translates to 2-Sided Risk

RiskCentrix, LLC
Clarity in a World of Uncertainty

Upside Risk (Potential High Cost of Service)

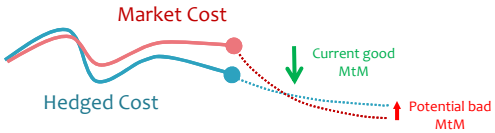
Volatility measurements indicate the magnitude of potential market price movements

Hedged Costs will migrate less



VaR-C
is the Potential Change in Forward Costs

Downside Risk (Potential Foregone Participation in Cost Declines, i.e., Hedge Losses)



VaR-L
is the Potential Change in MtM;
(In this case from a favorable to an unfavorable MtM)

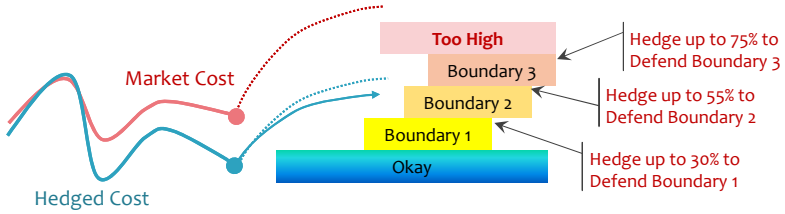
MtM = Mark to Market

How Can We Say That?

RiskCentrix, LLC
Clarity in a World of Uncertainty

"If properly designed, loss potential seldom exceeds tolerance"

Because if we observe multiple tiered boundaries we won't hedge to defend Boundary 2 until a favorable MtM [2] exists from Boundary-1 hedges, and we won't hedge to defend Boundary 3 until a even more favorable MtM exists from Boundary-1 & Boundary-2 hedges.



For each boundary, hedges are sized to eliminate only as much VaR as needed – no quantum jumps

Also, a reasonable options budget allows cost caps with minimal loss potential (i.e., the premium)

Simulations can be used to design & assess hedging decision rules that meet the three-legged constraints, even in substantially stressed market environments like 2005 and 2008 & following.

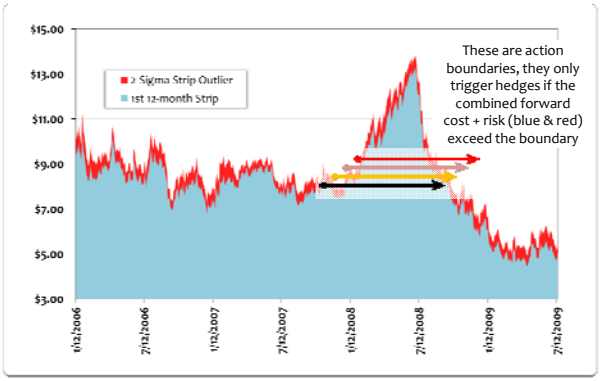
[2] MtM = Mark to Market

17

Just Suppose . . .
We Started in 2007 for Gas Year `07 – `08

RiskCentrix, LLC
Clarity in a World of Uncertainty

By Setting Tolerances for the coming gas year in the 3rd Quarter of 2007
when the 12-month forward strip was $8.00
and our top boundary "tolerance" might have been $9.25



As our metrics
(*Current forward portfolio value + 2-sigma risk*)
encroached on boundaries
. . .

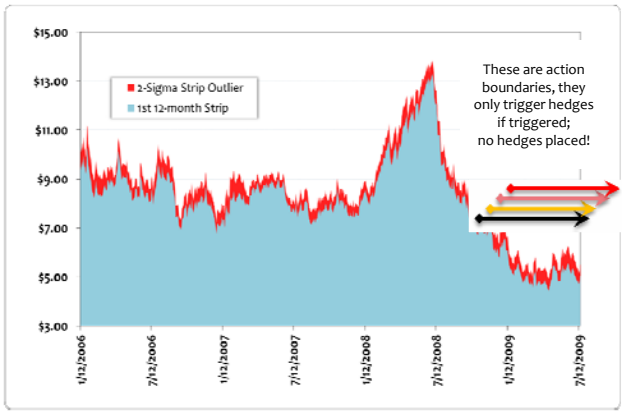
Hedges would have been accumulated at $8.00 - $9.00

18

Then in Q3 2008
We'd Set Revised Boundaries

RiskCentrix, LLC
Clarity in a World of Uncertainty

In Q3-2008 Boundaries would key off portfolio positions (hedged + unhedged) around $8.00/Dth . . .



We would have started that gas year substantially hedged, and

We would have already stopped new defensive hedges earlier, around Q2-2008, because we had hedged the peak before it materialized.

For the next few years we would probably hold small-volume programmatic hedges only.

19

RiskCentrix, LLC
Clarity in a World of Uncertainty

A Strawman for a Risk Management Regulatory Framework, Part II

Regulatory Hedge Workshop
March 2016

Presented by Mike Gettings, RiskCentrix
gettingsm@riskcentrix.com

20

Concepts

RiskCentrix, LLC
Clarity in a World of Uncertainty

Objectives -- Agree on two significant changes in concept and one important implication . . .

1. Rather than "reducing net volatility" set ***separate, but compatible objectives*** for cost containment and hedge loss containment.
2. Rather than preemptively setting a target hedge ratio, agree to set dual (cost & loss) tolerances, then measure risk and respond to conditions in order to defend tolerances

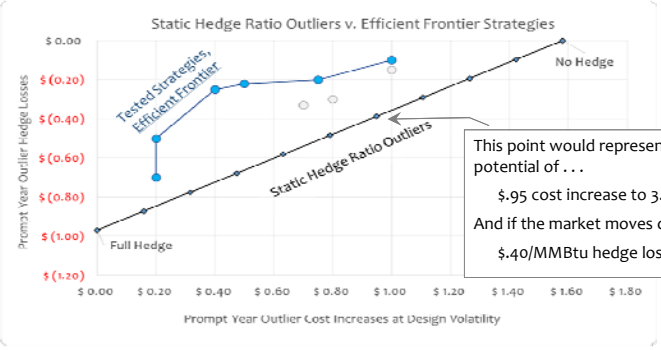
The Implication - By managing the polarized risk exposures, strategies can be developed to improve performance relative to the "Efficient Frontier" of potential outliers (next slide)

21

Strategies - Efficient Frontier

RiskCentrix, LLC
Clarity in a World of Uncertainty

Illustrative Results



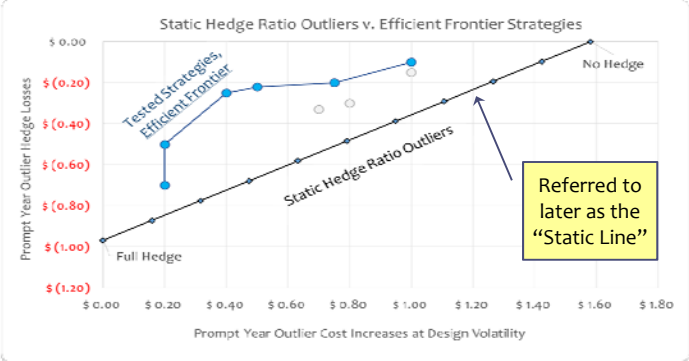
Assuming $2.50/MMBtu starting prices . . .

- The vertical axis shows 97.5% confidence hedge loss outcomes per MMBtu (Outlier losses)
- The horizontal axis shows 97.5% confidence gas cost increases per MMBtu (Outlier cost increases)
- Static strategies result in "outlier pairs" that fall on a straight line for any given design volatility
- Responsive strategies will push the outlier pairs toward the top left yielding a spectrum of customized choices. Some strategies will be superior to others on their face; they form the efficient frontier.

22

Strategies - Efficient Frontier

RiskCentrix, LLC
Clarity in a World of Uncertainty



One factor does not show on this two dimensional chart:

Options expenditures will tend to push results upward and leftward, and strategies should be assessed with an awareness and specificity as to an acceptable options budget.

Standardized Conventions
Language, Metrics & Design Specifications

RiskCentrix, LLC
Clarity in a World of Uncertainty

A. Hedge Types: Programmatic, Defensive, Contingent, Discretionary

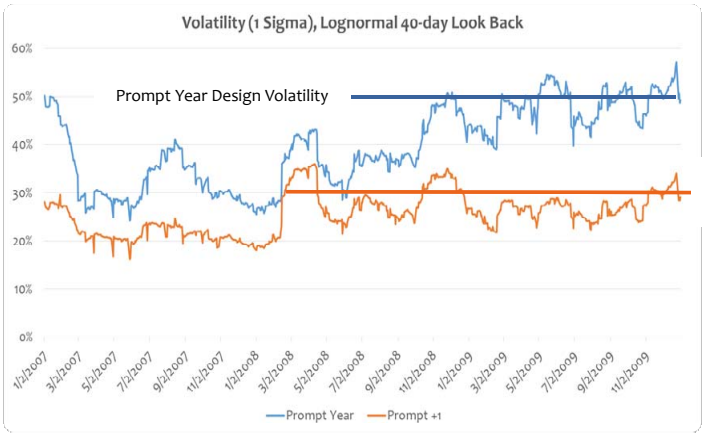
B. Volatility Estimation: Lognormal distribution
   i. Look back 30 to 60 trading days (LDC election) to estimate daily standard deviation
   ii. Then scale up to holding period(s) and annual values for a common reference

C. Value at Risk (2 directions: VaR.C & VaR.L)
   i. Holding Period for VaR.C: 10 trading days
   ii. Holding Period for VaR.L: 20 to 80 trading days (LDC election)
   iii. Confidence Level: 97.5% minimum (LDC election)
   iv. Review Interval: Weekly measurement & recording

D. Design Volatility for Strategy Development
   i. Prompt PGA Year: 50% average volatility (Based on representative prompt-year volatility from 2007 through 2009)
   ii. Prompt+1 PGA Year: 30% average volatility (Based on representative prompt+1-year volatility from 2007 through 2009)

Standardized Conventions
Strategy Design Volatility

RiskCentrix, LLC
Clarity in a World of Uncertainty

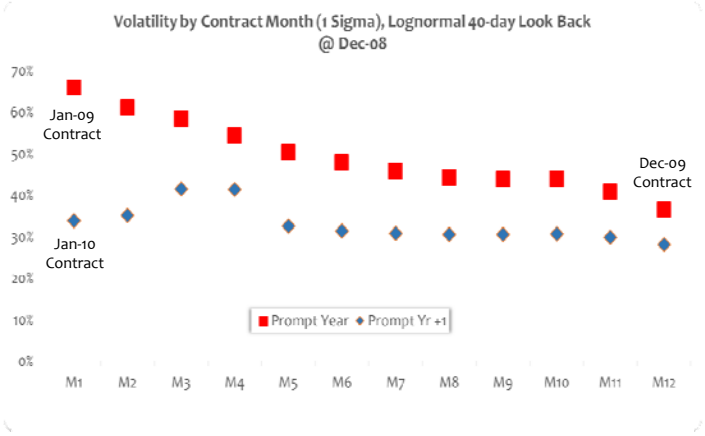


These values reflect rolling average volatility of 12 forward-looking futures contracts as measured by daily price changes for each futures contract over 40 prior days; daily volatilities were then annualized, i.e., multiplied by SQRT(252)

25

Strategy Design Volatility
By Monthly Contracts

RiskCentrix, LLC
Clarity in a World of Uncertainty



26

LDC Obligations

RiskCentrix, LLC
Clarity in a World of Uncertainty

3 Parts . . .

- Strategy Formulation to be included with Risk Filing
- Reporting Requirements
- Progression Along Learning Curve
  - Filing a "Capability Blueprint"

27

Strategy Formulation & PGA Filing

RiskCentrix, LLC
Clarity in a World of Uncertainty

5 Part Specification

1. Strategy Overview Specifications
2. Programmatic Strategy Specifications
3. Defensive Strategy Specifications
4. Contingent Strategy Specifications
5. Discretionary Hedge Specifications, if applicable

Guidelines follow for each . . .

28

RiskCentrix, LLC
Clarity in a World of Uncertainty

Typical Strategy Overview Specifications

1. Specify maximum permissible hedge ratio, using forecast procurement schedule as a denominator; provide reasoning. [1]
2. Specify maximum forward horizon for hedges, no less than "prompt" gas year plus one more.
3. Specify tolerances for cost of gas for each PGA year, preferably relating tolerance to PGA pass-through impact.
4. Specify hedge-loss tolerance; choose to focus on individual PGA years or aggregate over forward horizon, or both.
5. Specify explicit metrics to be used, particularly where discretion exists as to Value at Risk parameters.
   Holding Period for VaR.L - 20 to 80 trading days (LDC election)
   Confidence Level - 97.5% minimum (LDC election)
6. Specify means of conflict resolution if outlier costs and hedge loss potential both exceed tolerance.
7. Specify protocols for waiving the filed strategy in extraordinary environments, including notice to regulators.

[1] *Including storage injections as procurement needs, and netting storage withdrawals from procurement needs.*

29

RiskCentrix, LLC
Clarity in a World of Uncertainty

Typical Programmatic Strategy Specifications

1. Programmatic accumulation: Preferably, no more than 30% of total requirements or one-third of maximum hedge ratio; higher cost tolerances should correlate to lower programmatic accumulation.
2. Relative to the flow months, specify the start and end of programmatic hedge accumulation. Also specify hedge increments (volume per time period) including any discretion as to timing within that framework.
3. Specify contractual structures to be used (physical or financial structures).

30

RiskCentrix, LLC
Clarity in a World of Uncertainty

Typical Defensive Strategy Specifications

1. Specify each forward period to be the focus of VaR.C metrics.
2. Specify the response plan for defending tolerances against weekly risk assessments (VaR.C and related cost outlier for each PGA-period to the end of the specified holding period)
   a) Typically, responses will be structured as the defense of interim boundaries up to a maximum associated hedge ratio where the final boundary equals the ultimate cost tolerance and the ultimate maximum hedge ratio.
3. Specify a menu of contractual structures to be used in various risk responses (physical or financial structures) and how they will be deployed, including discretionary factors

31

RiskCentrix, LLC
Clarity in a World of Uncertainty

Typical Contingent Strategy Specifications

1. Specify if VaR.L metrics are to be monitored as the aggregate of all forward periods; alternatively, specify each forward period that will be the focus of VaR.L metrics.
2. Specify the response plan for defending hedge-loss tolerances using weekly risk assessments (VaR.L and related hedge-loss outlier to the end of the specified holding period for hedge-loss risk metrics).
3. Specify a menu of contractual tools and structures to be used in contingent risk responses (physical or financial tools) and how they will be deployed, including discretionary factors.

32

Typical Discretionary Hedge Specifications

RiskCentrix, LLC
Clarity in a World of Uncertainty

If applicable, describe criteria for discretionary hedges including how incremental risk of loss will be considered in the context of the overall strategy.

Reporting Requirements

RiskCentrix, LLC
Clarity in a World of Uncertainty

1. Minimum Recording Frequency: Weekly
2. Report Content: Annual report of weekly risk metrics and position summary for forward PGA periods, including hedge transactions – (see report template).

Typical Report

RiskCentrix, LLC
Clarity in a World of Uncertainty

Current Gas Year

Strategy:

Programmatic	Defensive Boundaries				Contingent Responses		
x% per month / Months: Start-Stop	Var.C Holding Period & Confidence Level	Boundary 1, Cost Boundary / Max Ratio	Boundary 2, Cost Boundary / Max Ratio	Boundary 3, Cost Boundary / Max Ratio	Var.L Holding Period & Confidence Level	Description	Dominant Protocol & Other Notes
2% / Mos. 24 -13	10 days / 97.5%	$ 4.40 35% swaps	$ 4.70 60% swaps	$ 4.95 80% swaps	80 days/ 97.5%	e.g., Overlay put options up to $8 million premiums, then if necessary, reverse swaps to the extent required by hedge loss metrics.	e.g., In the event of a conflict, contingent protocols will supercede defensive

Tracking

						Weekly Hedge Increments								
	Aggregate, at Volume Profile					Programmatic	Defensive			Contingent				
Week Ending	Portfolio Forward Cost	Forward Market Price	Mark to Market, $/MMBtu	Forecast Annual Needs, MMBtu	Hedge Ratio, % of Forecast Needs [c] (notional)	Weekly Hedge Additions [a]	VaR.C / MMBtu [b]	Cost Outlier Portfolio Cost + VaR.C	Defensive Hedge Additions [a]	VaR.L / MMBtu [b]	Hedge Loss Outlier MtM + VaR.L	Actions Taken, if any	Hedge Ratio, % of Forecast Needs [c] (delta equivalent)	Notes: Contingent Actions, Management Overrides, Judgments, etc
11/6/2015						% of Needs @ $/MMBtu			% of Needs @ $/MMBtu			explain; comments or footnote		
11/13/2015														
11/20/2015														
11/27/2015														
· 52 Weeks														

[a] *If options, provide supplemental info by footnote or otherwise: call or put, strike, expiry, and premium.*
[b] *If options are deployed, VaR.C and VaR.L should reflect hedge ratio on a delta-equivalent basis.*
[c] *Report hedge ratio for remainder of applicable gas year.*

Next Gas Year

Same format as above

While this summary report reflects prompt-year (and prompt-year+1) aggregates, supporting detail should be maintained by transaction and contract month.

Progression Along Learning Curve

RiskCentrix, LLC
Clarity in a World of Uncertainty

Each LDC would file a "Capability Blueprint" annually outlining then-current and any planned development for the coming year with respect to the following factors:

1. Risk Quantification, including systems
2. Strategy Formulation
3. Transactional Capability
4. Governance & Controls
5. Staffing assessment

Regulatory Compact

RiskCentrix, LLC
Clarity in a World of Uncertainty

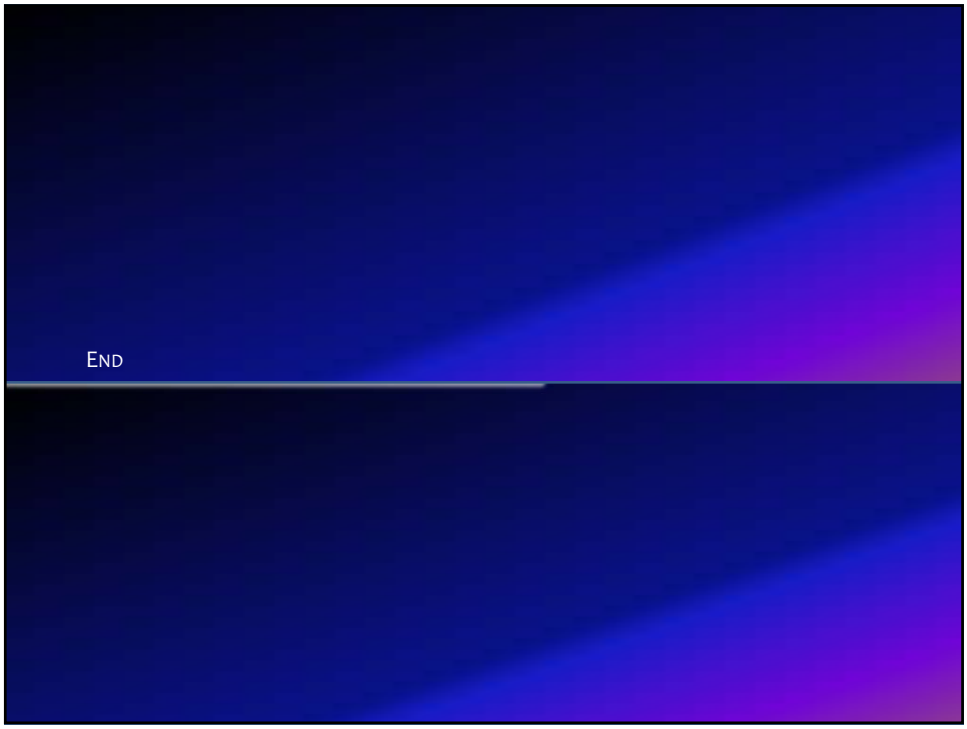
- Regulatory review of each Risk Filing (may be filed with the PGA, but a separate docket) will include . . .
  - Acknowledgment of the strategy or "no action" if found lacking
  - A qualitative assessment of the strategy as to conformance with the intent of this proceeding
  - Acknowledgment of the Capability Blueprint including specified incremental costs
- As companies demonstrate more robust strategy development and risk capabilities, they will have increasing assurance that prudence criteria will consist of assessing the faithful execution of the acknowledged strategy rather than a retrospective judgment of ad hoc decisions
  - Companies that file strategies with tolerance pairs materially superior to the "Static Line" and then execute accordingly will have a rebuttable presumption against cost challenges
  - Companies that file strategies with tolerances falling at or near the "Static Line" will be more vulnerable to cost challenges
- Prudent incremental costs would be recoverable in rates, and LDCs may petition for deferred accounting regarding incremental costs if needed
  - Staffing at cost
  - Systems, using _ year amortization

37

Discussion & Questions

Back to 2014 Workshop Excerpts

RiskCentrix, LLC
Clarity in a World of Uncertainty


END