

Should Regulated Utilities Hedge Fuel Cost and if so, How?

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THE **Brattle** GROUP

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Agenda

Why Cost Recovery Is Controversial?

Key issues in hedging

- Foundations
- What Hedging Can and Cannot Do
- Hedging Should Reflect Stakeholder Preferences
- Risk versus Regret

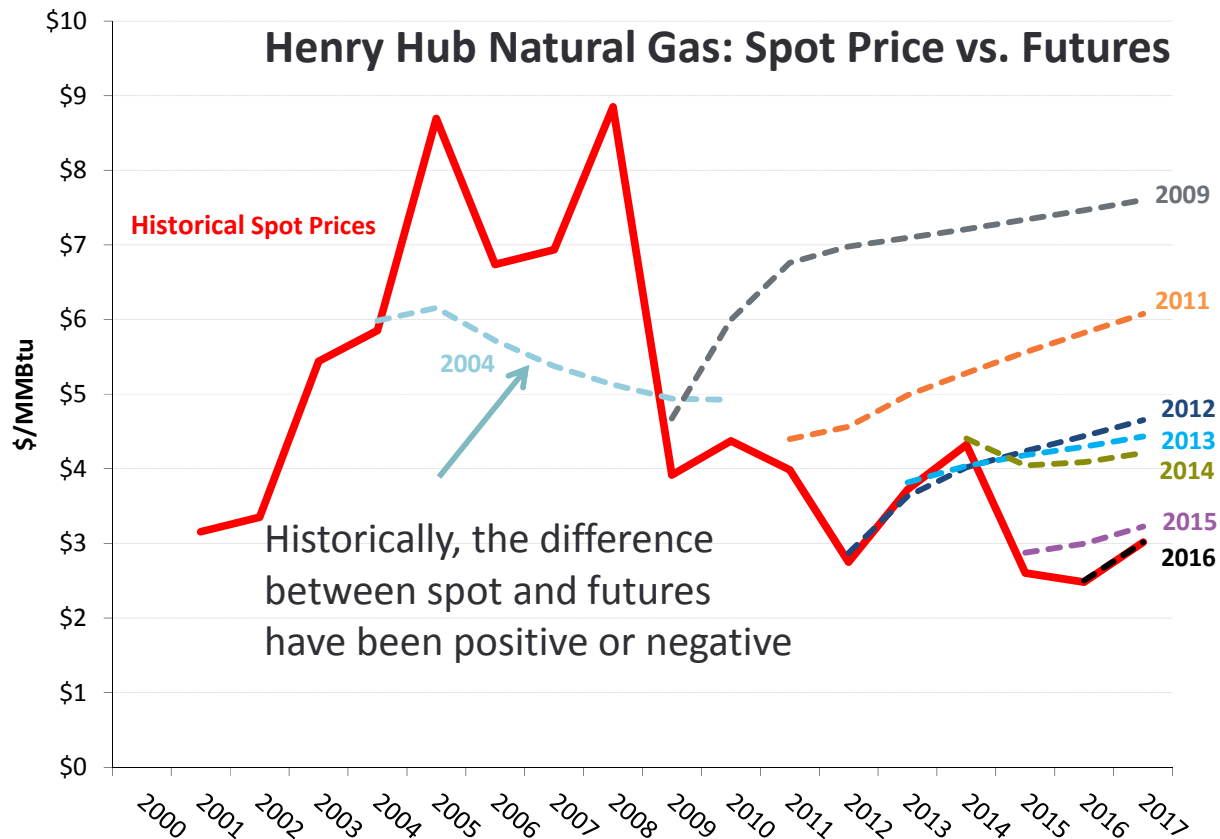
Practices of Hedging and Cost Recovery

- How are fuel and hedging costs recovered?
- What some other utilities do
- Utility hedging strategies and developments

Utility Hedging Observations

Why Is Recovery of Hedging Costs an Issue?

Natural gas spot prices have materialized substantially below forecasted natural gas prices in recent years – hence ex post hedging seems expensive



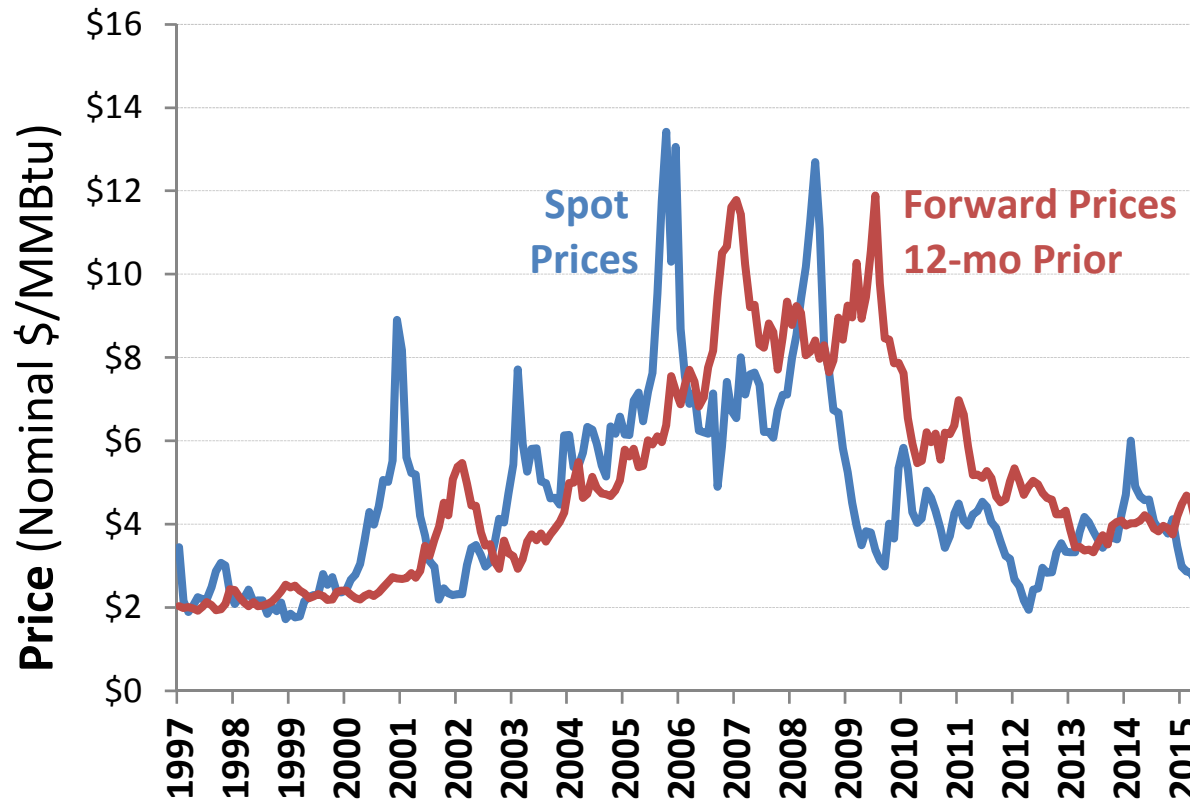
Sources/Notes:

Spot prices and NYMEX Futures prices retrieved from Velocity Suite, ABB Inc.

Annual NYMEX Futures prices calculated by averaging contract prices across all trade dates in a given year.

Historical Spot Prices vs. Forward Prices

Illustration: Monthly Natural Gas Prices



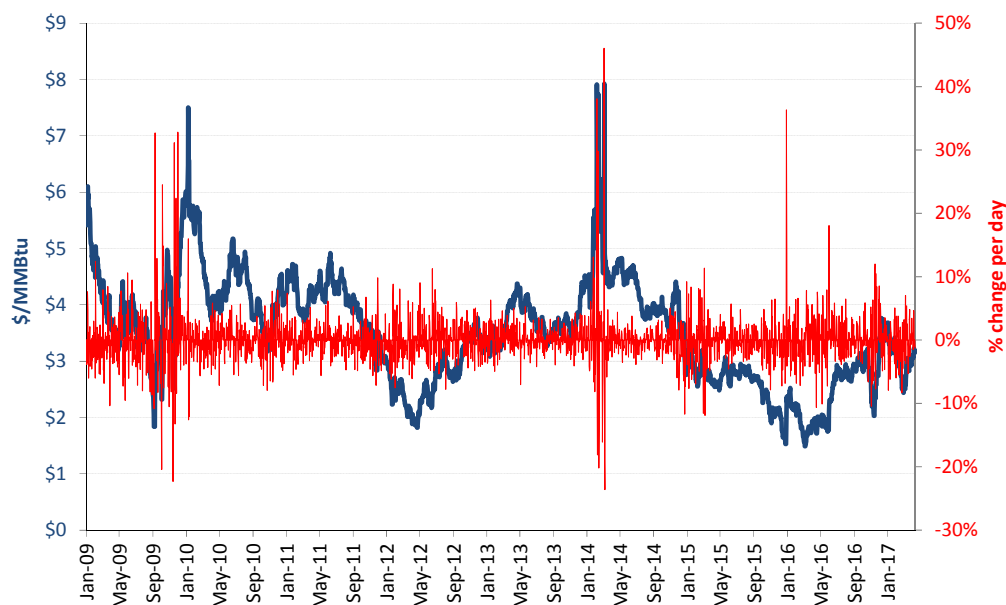
- Sometimes forward prices are higher; sometimes they are lower
- Spot prices are more volatile (and daily volatility not shown here)

Key Hedging / Risk Management Insights

- Risk management (hedging) is an ex ante reduction of cost uncertainty; not least cost planning tool (to help reduce expected costs)
- Important to set and monitor goals for risk reduction – *e.g.*, using agreed upon measures such as Value at Risk (VaR), hedging targets, ...
- No “one size fits all” for risk reduction; for a utility stakeholders engagement to determine appropriate risk management and hedging goals is vital; after all a utility is hedging on behalf of its customers
- *Ex post* reviews of hedge performance can be tricky; with well-established and agreed upon goals / targets, it is best to stick to reviewing adherence to risk control protocols

Foundations: Distribution of Gas Prices and Their Returns

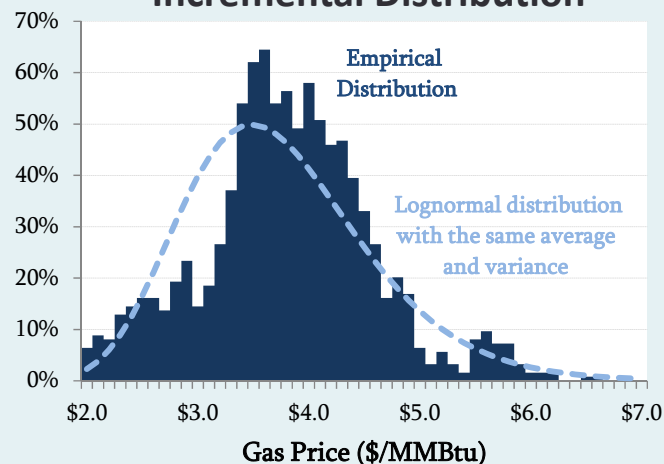
Historical Henry Hub Spot Prices and Returns
(2009 - 2017, Daily)



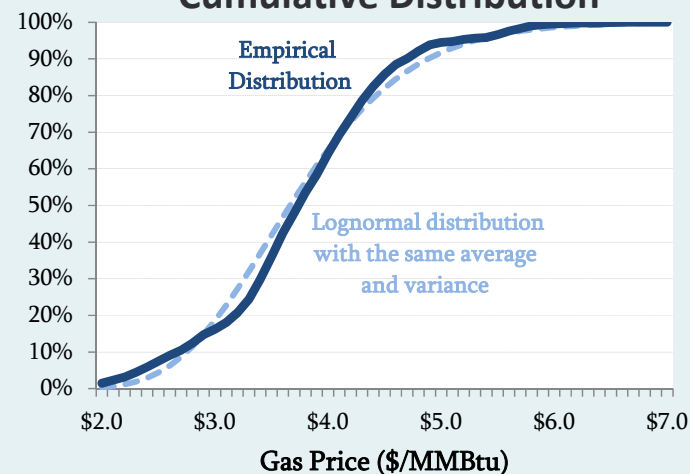
Sources/Notes:
Henry Hub historical spot prices retrieved from Velocity Suite, ABB Inc.

- Prices and returns (change in prices) typically follow a bell-shaped, normal distribution, which becomes an S-curve when expressed in cumulative terms
- Hedging narrows the likelihood of being at the tails or, in the case of options, cuts off the upper end of the distribution

Incremental Distribution



Cumulative Distribution

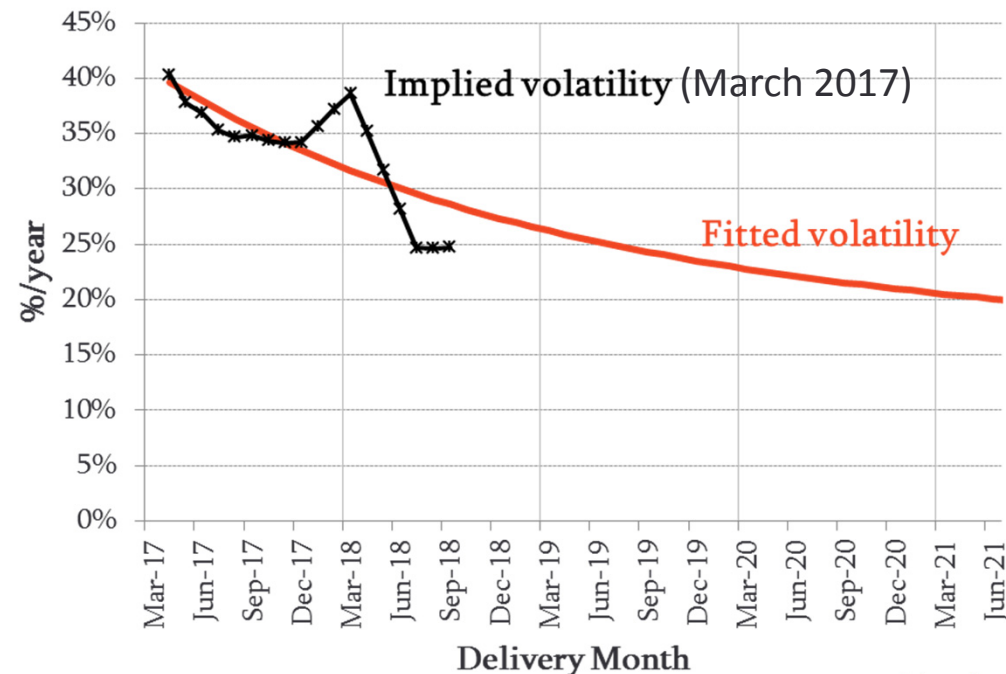


Key Decision Parameter: Implied Volatility

- Option Price is often determined using the Black-Scholes formula:

Price	= mathematical function of	Time to maturity	Strike price	Current forward	Risk-free rate	Volatility
known	Black- Scholes	known	known	known	known	unknown

- All parameters except the volatility are known, so we can derive the “implied volatility” from the other terms
- Higher volatility, higher risk for price changes
- Quoted volatilities are implied volatilities available from brokers, published on Bloomberg, et al.



What Hedging Can and Cannot Do

As part of a risk management program, hedging uses market-priced, standardized financial hedging instruments to limit potential future (delivery period) cost variability

- Utility is a price-taker in a competitive market; cannot expect to gain (or lose) relative to being unhedged
- No effect on expected present value of commodity hedged
- Forwards, Futures, Swaps, (Storage) aim to increase the level of certainty surrounding cost
- Call Options aim to eliminate the upper end of the price distribution

Hedging:

- Does not have an effect on the expected present value of the commodity being hedged; i.e., it does not reduce *ex ante* expected costs
- is not expected to lead to gains or losses, but the difference between the cost of hedged volume likely differ from the spot cost of the same volume *ex post*

Purpose of risk management is to avoid *ex post* potentially extreme outcomes, not to reduce *ex ante* expected costs

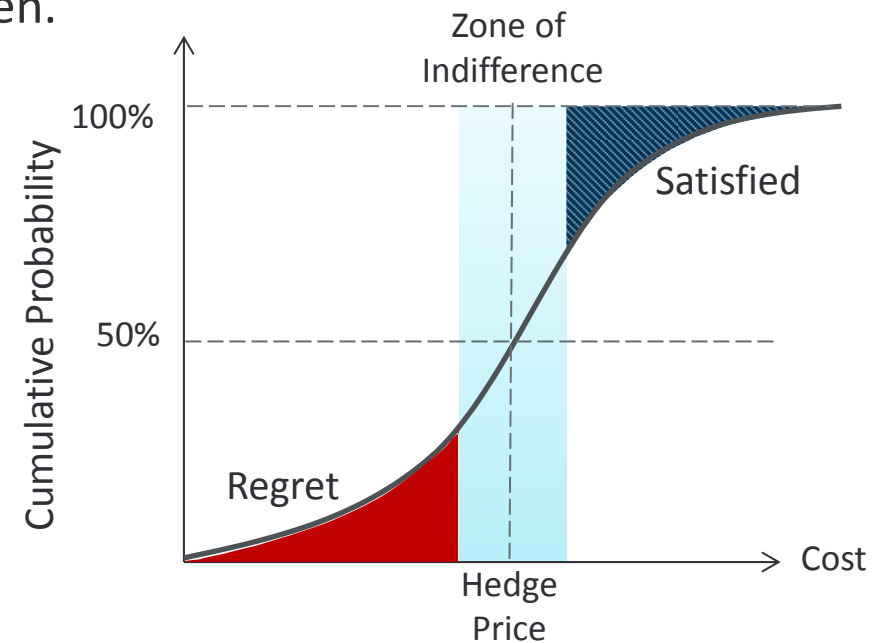
Hedging Should Reflect Stakeholder Preferences

Purpose of risk management is to avoid *ex post* potentially extreme outcomes, not to reduce *ex ante* expected costs

- The Utility is acting as an agent to avoid price volatility and avoid a portion of potentially disruptive cost extremes
- Akin to insurance agent offering insurance for your home
 - Broker has a menu of low to high coverage, low to high deductible policies
 - All policies are fairly (actuarial) priced
 - No “right” choice feasible by agent; up to customer to choose based on needs and preference (agent simply act as intermediary)
- Hence, hedging is per the taste of customers, but clear guidance is needed (and customer preferences may not be uniform)
- Tension: risk versus regret—requires customer and regulatory input

Risk versus regret

- Risk is *ex ante* exposure to future volatility (unexpected potential variability)—eliminated by forward purchases at fixed or capped prices.
- Regret is *ex post* disappointment if a hedge turns out to be more costly than not hedging would have been.
 - However, insurance has value even if not used
 - Regret is a valid concern, but:
 - Regret reduction is generally antagonistic to risk reduction
 - The more *ex ante* certainty, (risk reduction) the greater the chance of *ex post* disappointment (regret), and *vice versa*

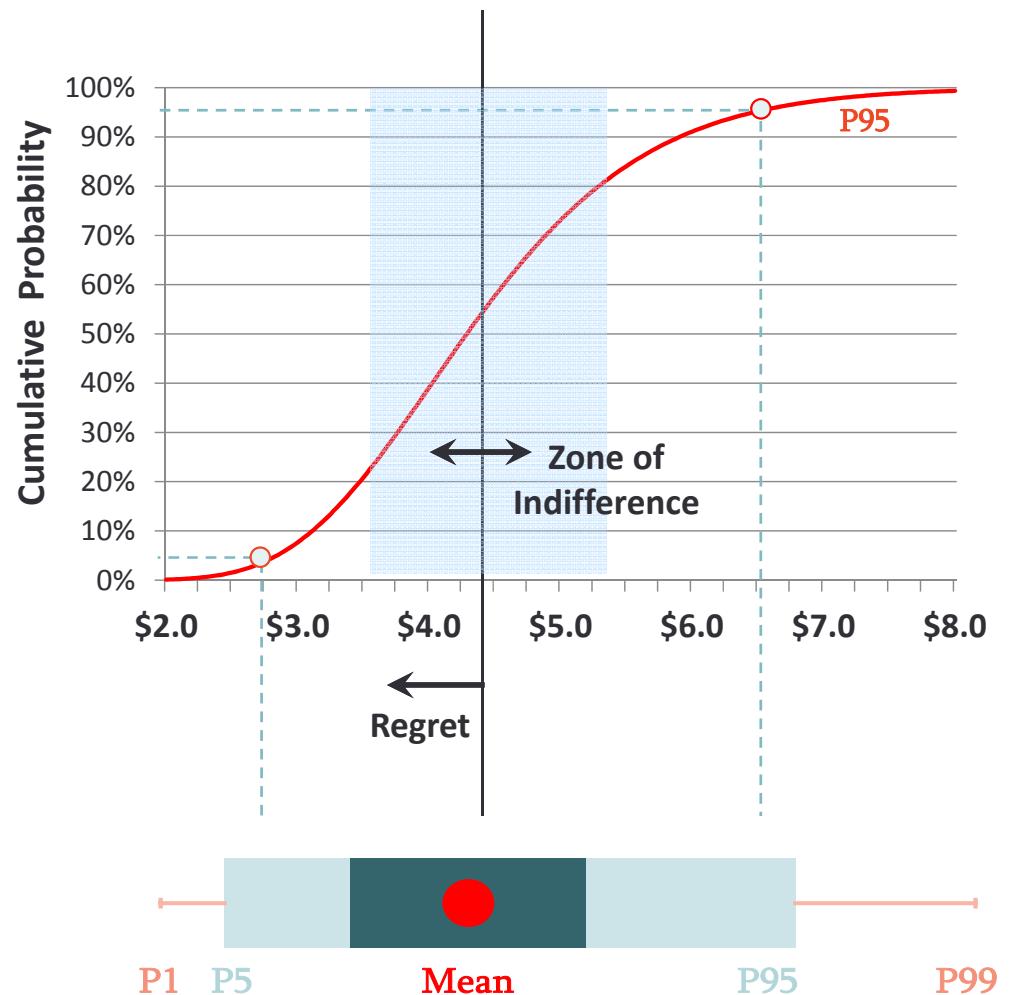


Alternative hedging strategies can shift the weight between risk and regret exposure—subject to customer preferences.

Specifying Goals for Risk Management

Developing an effective hedging strategy requires four types of information based on consumer preferences:

- Extreme risk tolerance (how high is too high?)
- Regret avoidance (do you want the low end open?)
- Zone of indifference (how wide or narrow should the middle section be?)
- Time frame (how far ahead do you want these assurances?)



Pros and cons of risk management strategies

	Pros	Cons
Unhedged	<ul style="list-style-type: none"> ➤ Efficient price signal from market ➤ No regret 	<ul style="list-style-type: none"> ➤ No risk protection
“Dollar Cost Averaging” (installment purchases)	<ul style="list-style-type: none"> ➤ Continual hedging ➤ Can adjust volumes over time as forecasted needs change 	<ul style="list-style-type: none"> ➤ Leaves risk open while waiting for future installments ➤ Can seem mechanical or passive
Options	<ul style="list-style-type: none"> ➤ With calls, can price while leaving open the low price opportunities ➤ Can fund with put sales (collars) 	<ul style="list-style-type: none"> ➤ Incurs up-front cost ➤ Possibility of “unused” insurance (calls expire out of the money)
Early hedging	<ul style="list-style-type: none"> ➤ Locks in prices and risk reductions ahead of time 	<ul style="list-style-type: none"> ➤ Higher probability for regret: cannot adjust volume or price later
VaR and TEVaR Limits	<ul style="list-style-type: none"> ➤ Focus on the risk of the net open position 	<ul style="list-style-type: none"> ➤ Usually about high cost extremes only; does not consider regret exposure



Practices

How Are Fuel and Hedging Costs Recovered?*

Most states with integrated electric utilities have some form of fuel adjustment clauses that true-up (part of) prudently incurred fuel cost

- Some jurisdictions have incentives that share the difference between actual fuel cost and the fuel cost reflected in rates between the utility and customers: *E.g.*, ID, OR, SD, UT,

Most states with a FAC include hedging costs as part of fuel cost recovery subject to prudence review

- AL, CO, FL, GA, KS, MI, MN, NJ, NC, ND, OR, WI, WV have explicitly recognized the need for hedging cost recovery (although not necessarily without controversy or sharing)
- Controversy pertains to the
 - volume and horizon of hedging
 - method of hedging
 - impact on rates

* I would love specifics from states that I do not mention

Utility Hedging Strategies and Developments

Dollar-cost averaging (DCA):

- Each period a fixed dollar amount is used to hedge natural gas or other commodity

Time Averaging

- Anticipated commodity requirements (or a fraction hereof) are covered through though a series of forward transactions, the amounts and timing of which are set forth in a pre-specified schedule
 - E.g., Ensure that 20% of load is covered 2 years forward, 30% 1 year forward and 40% 6 months forward.

Value-at-Risk

- Target a certain Value-at-Risk, so that at e.g., 95% probability gas costs will not exceed \$x

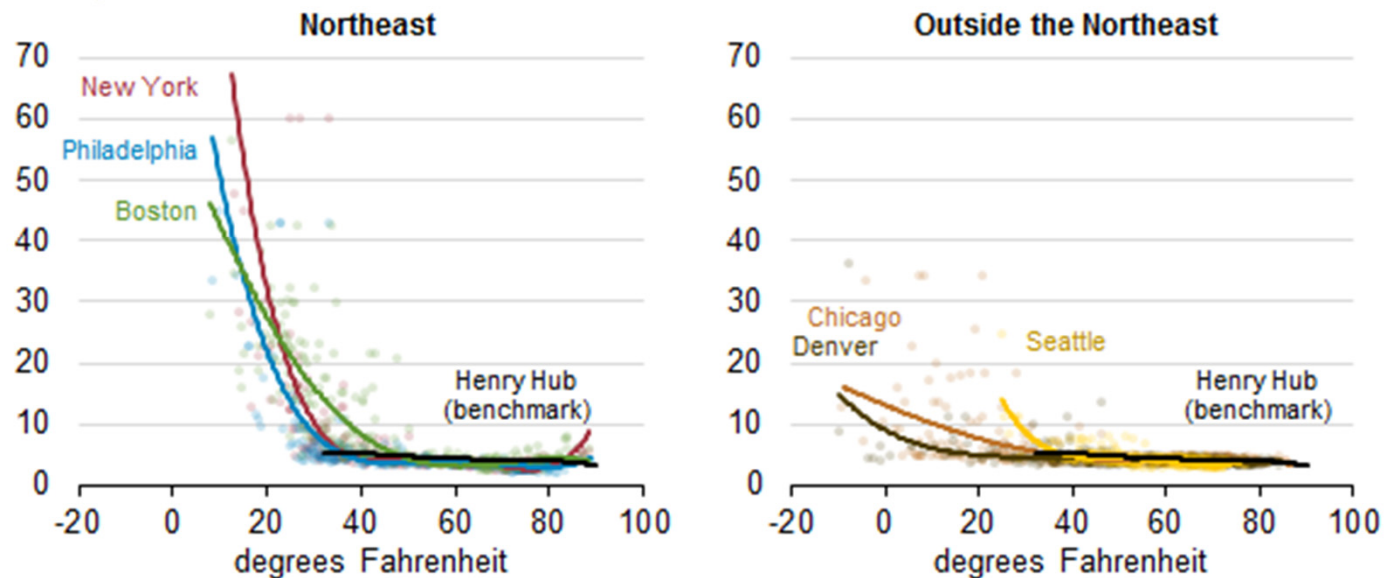
Acquiring gas fields

- So far this has been limited, but Northwest Energy has invested in such resources

Utility Hedging Strategies and Developments 2

An often overlooked issue – basis risk

Daily natural gas spot prices vs. temperatures
July 1, 2013 through August 6, 2014
dollars per million British thermal units



Hedging gas prices at Henry Hub (in Erath, Louisiana) may not be enough if you are located in the Northeast

Basis risk has become a much larger issue in recent years.

Examples of Utility Hedging Strategies

	PSE&G	SJG	ETG	NJNG
Hedge horizon (2009)	≤ 18 months	≤ 18 months	13-24 months	7-18 months
Hedge horizon (2013)	≤ 18 months	≤ 18 months	≤ 18 months	≤ 18 months
Hedge horizon (2016)	≤ 18 months	n/a	≤ 18 months	≤ 18 months
Target/actual (% 2009)	33%	n/a	n/a	25% annual
Target/actual (% 2013)	31% S & 72% W	50.4%	47% 18 months	62% winter
Target/actual (% 2016)	37%	n/a	63%	61% winter
Winter > Summer hedging	YES	YES	Not known	YES
Instruments (2009, 2013, 2016)	Energy and Basis Swaps	Energy Swaps & Futures	Energy and Basis Swaps, Options	Energy Physical Options , Swaps
Measures (limits)	% hedged	% hedged	% hedged	% hedged VaR
Programs or Methods*	Planalytics 2014 DCA	Planalytics 12% SIM 22% DCA 17%	Not known	Not known

Sources: Pace Report and utilities' 2012-13, 2016 BGSS reports to NJ BPU. **RED** indicates changes between 2009 and 2012, **BLUE** indicates changes between 2013 and 2016. * Methods were not available for 2016.

Utility Hedging Observations

- Hedging is often based on tried and true methods, but there is an increased emphasis on accountability and adaptability
- Continual low gas prices have led to perceived losses and in some cases less hedging appetite
 - Recent decisions in CO, FL, WA
 - continue to endorse hedging activities,
 - ask for the development of more sophisticated strategies, adaptability, and methods of measuring risk
- Need to engage stakeholders in an evaluation of appropriate methods:
 - Workshops / generic proceedings: FL, UT, WA, WV, WY
- Reporting and continued dialog between stakeholders

Where Do We Go From Here

- Currently very low gas prices provide a unique window of time to engage in a discussion of how best to hedge going forward
- Need to develop “consensus” on
 - Risk vs. regret tradeoff: How much are stakeholders willing to pay to avoid very high prices (acquiring options)
 - How important is the risk of having “overpaid” – regret?
 - What is an appropriate reporting schedule and what should be reported?
 - Volumes hedged and prices by delivery month?
 - Instruments used? (price paid, if applicable)
 - Plans for the next 6, 12, 18, ... months?
- *Ex post* reviews of hedge performance is best done by keeping to reviewing adherence to risk control protocols as specified in collaboration with the regulator



QUESTIONS?

About The Brattle Group

The Brattle Group provides consulting and expert testimony in economics, finance, and regulation to corporations, law firms, and governmental agencies worldwide.

We combine in-depth industry experience and rigorous analyses to help clients answer complex economic and financial questions in litigation and regulation, develop strategies for changing markets, and make critical business decisions.

Our services to the electric power industry include:

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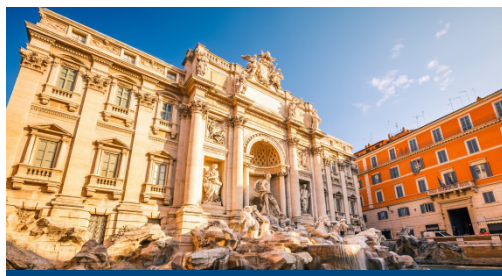
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About the Presenter



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Dr. Bente Villadsen is a principal at The Brattle Group's Cambridge office. She is an expert in regulatory finance with more than 17 years of experience in the utility regulatory matters. She has experience in electric, gas, pipeline, railroad, and water regulatory matters and has testified on cost of capital as well as regulatory accounting and credit issues for regulated entities. She is a frequent author and speaker on rate of return, capital structure and regulatory accounting issues and has co-authored the forthcoming text, *"Risk and Return for Regulated Industries,"* (Elsevier 2017), contributed to white papers for industry organizations and regulators; e.g., the Edison Electric Institute, the Australian Pipeline Industry Association, the British Columbia Utilities Board, the Canadian Transportation Agency, and the National Association of Water Companies. Much of her recent work has focused on the impact of regulatory initiatives such as decoupling or riders and trackers on cash flow, credit metrics and the cost of capital. Dr. Villadsen also provides advice on utility M&A and risk management and recently co-authored *"Managing Price Risk for Merchant Renewable Investments: Role of Market Interactions and Dynamics on Effective Hedging Strategies,"* Brattle Whitepaper. She holds a Ph.D. from Yale University's School of Management and joint degree in mathematics and economics from University of Aarhus in Denmark.