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

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PREPARED BY

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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.

**Henry Hub Natural Gas: Spot Price vs. Futures**

Historically, the difference between spot and futures have been positive or negative.

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
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.
Key Decision Parameter: Implied Volatility

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

<table>
<thead>
<tr>
<th>Price = mathematical function of</th>
<th>Time to maturity</th>
<th>Strike price</th>
<th>Current forward</th>
<th>Risk-free rate</th>
<th>Volatility</th>
</tr>
</thead>
<tbody>
<tr>
<td>known</td>
<td>known</td>
<td>known</td>
<td>known</td>
<td>known</td>
<td>unknown</td>
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</table>

- 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

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<tr>
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<th><strong>Pros</strong></th>
<th><strong>Cons</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Unhedged</strong></td>
<td>- Efficient price signal from market</td>
<td>- No risk protection</td>
</tr>
<tr>
<td></td>
<td>- No regret</td>
<td></td>
</tr>
<tr>
<td><strong>“Dollar Cost Averaging” (installment purchases)</strong></td>
<td>- Continual hedging</td>
<td>- Leaves risk open while waiting for future installments</td>
</tr>
<tr>
<td></td>
<td>- Can adjust volumes over time as forecasted needs change</td>
<td>- Can seem mechanical or passive</td>
</tr>
<tr>
<td><strong>Options</strong></td>
<td>- With calls, can price while leaving open the low price opportunities</td>
<td>- Incurs up-front cost</td>
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<tr>
<td></td>
<td>- Can fund with put sales (collars)</td>
<td>- Possibility of “unused” insurance (calls expire out of the money)</td>
</tr>
<tr>
<td><strong>Early hedging</strong></td>
<td>- Locks in prices and risk reductions ahead of time</td>
<td>- Higher probability for regret: cannot adjust volume or price later</td>
</tr>
<tr>
<td><strong>VaR and TEVaR Limits</strong></td>
<td>- Focus on the risk of the net open position</td>
<td>- Usually about high cost extremes only; does not consider regret exposure</td>
</tr>
</tbody>
</table>
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 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
An often overlooked issue – basis risk

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

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

**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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<th>Rate Design and Cost Allocation</th>
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<td>Regulatory Strategy and Litigation Support</td>
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<td>Demand Forecasting Methodology</td>
<td>Renewables</td>
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<td>Demand Response and Energy Efficiency</td>
<td>Resource Planning</td>
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About the Presenter

Dr. Bente Villadsen 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.