

REDACTED

Docket No. UE-227

Exhibit PPL/700

Witness: Frank C. Graves

**BEFORE THE PUBLIC UTILITY COMMISSION
OF THE STATE OF OREGON**

PACIFICORP

Redacted Surrebuttal Testimony of Frank C. Graves

August 2011

1 **Q. Please state your name and position.**

2 A. My name is Frank C. Graves. I am a Principal at the economics consulting firm
3 *The Brattle Group*, where I am also co-leader of the utility practice group.

4 **Q. Please summarize your qualifications and experience briefly.**

5 A. I specialize in regulatory and financial economics, especially for electric and gas
6 utilities. I have assisted utilities in forecasting, valuation, and risk analysis of
7 many kinds of long range planning and service design decisions, such as
8 generation and network capacity expansion, supply procurement and cost
9 recovery mechanisms, network flow modeling, renewable asset selection and
10 contracting, and hedging strategies. I have testified before the FERC and many
11 state regulatory commissions, as well as in state and federal courts, on such
12 matters as integrated resource planning (IRPs), the prudence of prior investment
13 and contracting decisions, costs and benefits of new services, policy options for
14 industry restructuring, adequacy of market competition, and competitive
15 implications of proposed mergers and acquisitions. I am the author of several
16 publications in risk management and recently co-authored a white paper
17 managing gas price volatility.¹ I received an M.S. with a concentration in finance
18 from the M.I.T. Sloan School of Management in 1980, and a B.A. in Mathematics
19 from Indiana University in 1975. A detailed resume and C.V. is attached as
20 Exhibit PPL/701.

¹ Frank C. Graves and Steven H. Levine, "Managing Natural Gas Price Volatility: Principles and Practices Across the Industry," *American Clean Skies Foundation*, November 2010.

1 **Q. Have you previously testified for PacifiCorp (the Company) in regard to risk**
2 **management and hedging?**

3 A. Yes. I filed testimony on behalf of the Company before the Public Service
4 Commission of the State of Utah in Docket No. 10-035-124. I also filed
5 testimony in the Company's request for a power cost adjustment mechanism in
6 Utah, Docket No. 09-035-15, some of which addressed risk management and
7 hedging.

8 **Q. What is the purpose of your testimony?**

9 A. I have been asked to review the rebuttal testimonies of Mr. Ed Durrenberger of
10 the Staff of the Public Utility Commission of Oregon (Staff), Messrs. Bob Jenks
11 and Gordon Feighner on behalf of the Citizens' Utility Board of Oregon (CUB)
12 and Mr. Donald Schoenbeck on behalf of the Industrial Customers of Northwest
13 Utilities (ICNU) and to respond to the views on PacifiCorp's hedging policy.

14 Specifically, I have been asked to address Mr. Schoenbeck's
15 recommendation that substantial hedging costs be disallowed because PacifiCorp,
16 in Mr. Schoenbeck's view, executed "too many transactions too soon"² and
17 Messrs. Jenks' and Feighner's recommendation that the costs of certain natural
18 gas hedges that extend beyond 48 months be disallowed. I understand that
19 Messrs. Jenks and Feighner have revised their position regarding hedges in the
20 37-48 month range, as CUB acknowledges the market now is more liquid than a
21 few years ago.³

22 These intervenors' allegations or concerns are that such hedges were

² ICNU/110, Schoenbeck/10.

³ CUB/200, Jenks - Feighner/7.

1 inappropriate due to their tenor, which may involve reduced liquidity and greater
2 exposure to mark-to-market valuation changes than shorter hedges.

3 **Q. What are your general conclusions?**

4 **A.** I believe that much of this criticism simply reflects hindsight frustration, rather
5 than a finding that PacifiCorp's hedging practices were imprudent. Given the
6 substantial reductions in natural gas prices that have occurred in the past three
7 years due to the recession and shale gas developments, several of PacifiCorp's
8 long-dated hedges entered in 2007-2009 are now out of the money and contribute
9 to an increase in hedging costs in this proceeding. However, regret over realized
10 prices is not an appropriate basis for concluding the hedges were unreasonable. I
11 agree with Staff that "in the context of what was known at the time, ... it was
12 prudent...to enter into contracts to lock down long term supply at the then current
13 market price of gas."⁴ I disagree with Mr. Schoenbeck's adjustment for hedges
14 over 36 months because PacifiCorp executed "too many transactions too soon,"
15 and CUB's view that all hedges over 48 months should be disallowed. I
16 demonstrate that based on what was known and knowable at the time of
17 transactions being questioned, PacifiCorp's hedging length and volumes were
18 reasonable, even after prices began falling in mid-2008 (because risk indicators
19 were still rising well into 2009).

20 I find that the proposed hedging strategy presented by ICNU as the basis
21 for its adjustment in its rebuttal testimony has not been justified by any analysis
22 other than that in hindsight it would have resulted in lower gas prices under the

⁴ Staff/300, Durrenberger/10.

1 unique conditions of the last few years. The strategy proposed by ICNU would
2 expose customers to additional risks compared to the hedging policies PacifiCorp
3 has used and uses now. No evidence has been presented that reducing the
4 percentage hedged or the tenor and timing of forward hedges (to shorter horizons)
5 would be beneficial in general, so there is no risk management basis for accepting
6 the adjustments.

7 In general, ICNU's and CUB's rebuttal criticisms of long-dated hedges
8 ignore the fact that the incremental costs of hedging beyond 36 or 48 months
9 (compared to shorter horizons) are in general minimal, especially when offset
10 against the cost savings associated with the use of standard market products to
11 which Mr. Stefan Bird has testified. Indeed, in some cases PacifiCorp's long-
12 dated hedges were less costly in hindsight than shorter hedges that became
13 available in subsequent months would have been. By seeking to disallow hedges
14 beyond 36 months and 48 months, respectively, ICNU and CUB fail to take into
15 account that the alternative to longer dated hedges is not no hedging but rather
16 hedging somewhat later (and possibly adjusting other portfolio positions as well,
17 to maintain risk limits). The difference between the costs of, for example, a
18 hedge for January 2011 entered into in December of 2007 vs. one entered in
19 January 2007 would be modest.

1 **Hedging Too Much Too Soon**

2 **Q. ICNU argues that PacifiCorp executed too many hedges too far in advance**
3 **and therefore was imprudent with respect to hedges beyond 36 months.⁵**
4 **Messrs. Jenks & Feighner on behalf of CUB reject hedges beyond 48**
5 **months.⁶ What is your response?**

6 A. I disagree that there is any *per se* flaw or problem with hedging three to four years
7 or more forward. Hedging does not change the expected costs of future supply; it
8 just changes the range and shape of potential costs around that expected level.
9 There is no intrinsically “best shape” to which those potential costs should be
10 constrained; that is a matter of risk tolerances for non-commodity costs the
11 unhedged risks could impose. For the same reason, there is no intrinsically “right”
12 horizon of forward cover (as long as there is reasonable liquidity, as measured by
13 bid-ask spreads and availability of a reasonable number of counterparties.) The
14 relevant horizon depends on the extent of risk reduction and cost predictability
15 that is desired for future periods, i.e., on the risk reduction goals desired by the
16 beneficiaries of the hedging.

17 What the Company’s risk reduction goals should be is certainly an
18 appropriate topic for debate about customer needs and preferences, but it is not
19 fair or reasonable to criticize a practice after the fact because it happens to have
20 resulted in some currently out of the money hedges. In fact, as I explain later,

⁵ ICNU/110, Schoenbeck/11. ICNU argues that selected volumes should be disallowed because the Company “hedged [redacted] of test year requirements by [redacted] and lacks documentation to support these transactions.” [ICNU/110, Schoenbeck/12.] The allegation that the Company lacks documentation is addressed in the Surrebuttal testimony of Company witness Mr. Bird, so I address only the issue of hedging 37 or more months out.

⁶ CUB/200, Jenks - Feighner/8.

1 such look-back assessments of hedging “success” or disappointment are not
2 appropriate tests of hedging prudence, nor do they provide much guidance about
3 desirable hedging practices.

4 **Q. What specifically does ICNU witness Schoenbeck criticize?**

5 A. Mr. Schoenbeck offers a view of prudence and alternative risk reduction goals
6 that are not grounded in risk management metrics or any review of market
7 conditions prevailing at the time of hedging:

8 In my view, entering into transactions that have delivery periods
9 beyond 48 months, or if too many transactions are executed too far
10 in advance, it is imprudent.⁷

11 He suggests a disallowance of \$64.8 million system wide, or \$16.2 million
12 Oregon⁸, based on his opinion that hedge volume targets should have declined

13 [REDACTED]
14 [REDACTED]
15 [REDACTED].⁹ The

16 risk management efficacy of this prescription is not addressed in Mr.
17 Schoenbeck’s testimony nor quantitatively supported in his workpapers. In my
18 experience, it is unusual and ill-advised to see an adjustment this large and far-
19 reaching with little or no analytical support of its purported economic benefits.

20 **Q. ICNU acknowledges the benefits and costs of hedging.¹⁰ If there are both
21 benefits and costs, how do long-dated hedges help manage these tradeoffs?**

22 A. As noted in Mr. Schoenbeck’s rebuttal, companies that engage in hedging will

⁷ ICNU/110, Schoenbeck/11.

⁸ ICNU/110, Schoenbeck/3.

⁹ Confidential Exhibit ICNU/103, Schoenbeck/15.

¹⁰ ICNU/110, Schoenbeck/12.

1 experience gains during some time periods and losses during others. Thus,
2 hedging cannot be evaluated in terms of whether it captured such gains and
3 avoided such losses, but in terms of how well it dampened exposures to large
4 swings in natural gas prices. Long-dated hedges can play a useful role in this
5 regard.

6 Looking at a few key events affecting natural gas during the past decade
7 or so, there were high prices in 2000 – 2001, largely due to the western power
8 crisis, followed by a general drop until around late 2005 when Hurricanes Katrina
9 and Rita hit and pushed gas prices up to \$8-10 or more per MMBtu. These abated
10 down to around \$5-6/MMBtu for a while, but dramatic global economic
11 expansion and the rapid growth of oil and commodity prices in 2007-2008 caused
12 another spike to around \$12. (This was the context facing PacifiCorp at the time
13 of the long-dated hedges criticized in this proceeding.) Then the financial crisis
14 and resulting recession, combined with the shale gas revolution, pushed prices
15 back down to much lower gas price levels today. This low cost pattern may last
16 for a few years, but it is certainly plausible that there will be resurgence to high
17 fuel and power prices once the economy picks up steam, tighter environmental
18 regulations take effect, and perhaps inflation sets in.

19 The point is not that three-year, four-year, or even longer term hedges are
20 good or bad, but that they can serve a purpose, if desired, of smoothing out long-
21 wave variations in energy market conditions. This will feel like a benefit when the
22 hedges are in-the-money (below current spot or replacement costs) but may be
23 disappointing when they are more expensive. Unfortunately it is not possible to

1 arrange to be exposed to just one of those two possible outcomes. Hedging
2 inherently comes with the possibilities of both after the fact satisfaction and after
3 the fact regret.

4 **Q. Do you have an opinion on what the consequences would be of eliminating**
5 **hedges beyond 36 or 48 months?**

6 A. Yes. First, I note that if the concern is hedging beyond 36 or 48 months, then the
7 most reasonable comparison is to determine the marginal transaction cost benefit
8 or costs of waiting to hedge until delivery is 36 or 48 months or less ahead. The
9 appropriate comparison or criticism is not to simply throw out cost recovery for
10 such hedges as if nothing would have ever replaced them. PacifiCorp would still
11 have had overall portfolio risk goals to satisfy on behalf of its customers and
12 shareholders, and it would have had the possibility of entering somewhat shorter
13 dated hedges a few months later. Those alternative hedges would likely have had
14 little, if any incremental transaction-cost benefit associated with using slightly
15 shorter dated market products.

16 Moreover, waiting to hedge with future, shorter dated positions would
17 have increased risks, in addition to changing the realized costs. This occurs for
18 two reasons. First, there is risk (likelihood) that forward prices will change over
19 time while waiting to enter deferred hedges. This intrinsically happens from
20 waiting, even if volatility levels do not change. But second, as is shown in Figure
21 FCG – 4 below, the volatility levels in the market did increase through late 2009.
22 This means that PacifiCorp and its customers would have been facing more and
23 more future risk, the longer the Company waited to hedge.

1 **Q. Some of the criticism for long-dated hedges centers on their alleged**
2 **illiquidity. Is this a meritorious concern?**

3 A. No. First, as witnesses for Staff and CUB both acknowledge, there is no evidence
4 that markets were illiquid at the time of the transactions.¹¹ The market for natural
5 gas contracts has become much more liquid in recent years. Specifically, contracts
6 are generally available for well beyond a four-year horizon into the future. This is
7 especially true of bilateral or customized contracts.

8 Even if the market for long-dated gas contracts were illiquid, that would
9 not necessarily be bad for customers. It is possible to obtain “a good deal” in an
10 illiquid market. Illiquidity should be analyzed in terms of what incremental costs
11 it involves, rather than being used as a *per se* reason for dismissing all of the
12 value of entire positions. For this reason, the fact that a hedge was long-dated
13 does not in any way imply it will be harmful to consumers or is imprudent.

14 **Q. Please comment on Mr. Schoenbeck’s recommended hedging strategy on**
15 **which his adjustment is based.**

16 A. Mr. Schoenbeck reduces the volume hedged and the horizon over which gas
17 hedging occurs. Specifically, Mr. Schoenbeck’s strategy reduces the percentage
18 of the Company gas needs (volumes) that is hedged during forward years 1, 2, 3
19 and 4 and eliminates hedging beyond year 4. In addition, Mr. Schoenbeck’s
20 strategy reduces the percentage hedged during April, May, and June to [REDACTED]
21 [REDACTED] of his recommended hedge percentage for other months.¹² Mr.

¹¹ Staff/300, Durrenberger/6-7; CUB/200, Jenks - Feighner/7.

¹² ICNU/103, Schoenbeck/15.

1 Schoenbeck's adjustment is based on the difference between the mark to market
2 of the Company's hedging strategy and the strategy he proposes.¹³

3 **Q. Do you have any comments on Mr. Schoenbeck's hedging strategy?**

4 A. Yes. I have several comments. First, Mr. Schoenbeck's strategy does not
5 calculate the benefits or costs associated with reducing hedge targets and waiting
6 longer to hedge. He simply leaves more gas unhedged. Other than showing that
7 his approach would have lower mark to market costs at this time, he offers no
8 general justification for this recommendation. Second, he presents no analysis of
9 how much risk his recommended strategy would impose on the Company or leave
10 open for customers compared to the policy actually used, nor why the greater
11 amount of risk exposure his plan likely entails is a preferred arrangement in
12 general. It is simply a personal view point based on his after-the-fact review from
13 a 2011 perspective. He does not consider how his strategy would have appeared
14 in late 2007 and early 2008 in the face of then-increasing forward prices and
15 volatilities.

16 I also disagree with Mr. Schoenbeck's recommendation to hedge a smaller
17 percentage of the gas for deliveries in April, May and June than other months.
18 This suggestion is unnecessary, because the Company's "net need" for gas to be
19 hedged already takes the lower consumption of gas in the spring run-off months
20 into account. He is effectively making two adjustments for the hydro season –
21 both a lower quantity needed and a lower proportion of that to be hedged. He
22 offers no theory or explanation for reducing the latter hedging percentage by [REDACTED]

¹³ ICNU/100, Schoenbeck/3.

1 ██████ in three months. In fact, the market volatility data I describe below do not
2 support a belief that hydro run-off months are materially less risky than other
3 months.¹⁴ Thus, there is no reason to make an adjustment in hedging targets
4 above and beyond recognizing the reduced expected gas demand in these months.

5 **Q. Do you have any comments on application of ICNU's proposed hedging**
6 **strategy to the Company on a going-forward basis?**

7 A. Yes. ICNU's strategy is based upon fixed volumetric targets, and dictates a large
8 open position in year one. The strategy is a step backward for PacifiCorp, which
9 has moved to a more sophisticated and flexible TEVaR metric to set hedging
10 targets. Under this approach, the Company's hedged position is not based upon
11 fixed percentages, but rather is set in response to underlying market prices and
12 volatilities. In addition, by reducing the overall volume hedged and leaving a
13 large open position in year one, ICNU's strategy appears better designed for a
14 local gas distribution company with gas storage (such as NW Natural)¹⁵, not an
15 electric company with a resource portfolio as large and complex as PacifiCorp's.

16 **Q. Do witnesses for CUB offer any suggestions for alternative hedging goals or**
17 **practices?**

18 A. No. Messrs. Jenks and Feighner do not support hedges beyond 48 months, but
19 they do not present any suggestion for an alternative approach. This means there

¹⁴ I evaluated seasonality factors for all the series of broker volatility quotes from late 2007 to the present, and the monthly coefficients for April, May, and June averaged ██████ with a range from ██████ of the non-seasonal volatility. A coefficient of 1.0 would mean that these months do not have any expected difference in volatility from other months. Table FCG-A1 in the appendix included as Confidential Exhibit PPL/702 shows these monthly seasonality coefficients.

¹⁵ Even though many gas distribution companies also rely on much more complex hedging strategies than the one proposed by ICNU.

1 is no basis for assuming the risks or even *ex post* costs of their preferred
2 alternative would have been lower or more reasonable.

3 **Known and Knowable at the Time**

4 **Q. ICNU has described PacifiCorp’s hedging policies as imprudent, but has not**
5 **offered a normative view of how to define prudence.¹⁶ In your view, how**
6 **should prudence be defined?**

7 A. Any reasonable standards for prudence and cost recovery of a hedging policy
8 should be forward looking. Hindsight comparisons based on a single period of
9 recent history will not generally be informative because they are a single
10 “snapshot” of just one of many possible outcomes that might have occurred.
11 Historical analysis of hedging is useful only if the same kind of review can be
12 applied on many occasions over a long period of time, with the same underlying
13 risk conditions and hedging approach being used consistently throughout. For
14 electricity and gas markets, this is a very strong condition to impose. If market
15 conditions are not stationary, system configuration changes (e.g., more gas plants,
16 more renewables on the system, different hydro runoff, etc.), or the company’s
17 hedging approach evolves, then hindsight snapshots are purely circumstantial
18 views.

19 Instead of hindsight tests based on circumstantial *ex post* gains or losses,
20 prudence should be evaluated by whether reasonable risk reduction goals were
21 pursued, making good use of available information, with appropriate risk
22 management techniques and controls for the type and timing of hedges applied.

¹⁶ ICNU/110, Schoenbeck/11.

1 **Q. Is a hindsight review contrary to a proper prudence analysis?**

2 A. Yes. Prudence has to be judged on what was known and knowable at the time
3 about prospective risk. Staff witness Durrenberger appears to agree with the
4 assessment and states that: "... in the context of what was known at the time,
5 specifically that natural gas prices were increasing every year and that domestic
6 supplies of gas were forecast to be in decline, that it was prudent [for] PacifiCorp
7 to enter into contracts to lock down long term supply at the then current market
8 price of gas."¹⁷

9 **Q. Mr. Durrenberger also notes that natural gas forward prices for 2011-12**
10 **delivery were increasing during the 2007-08 period and that at the time the**
11 **energy companies on the west coast were planning the development of large,**
12 **expensive import terminals for liquefied natural gas (LNG) to reduce**
13 **exposure to future increases in gas prices. He finds that in this timeframe,**
14 **forward gas prices "were a reasonable forecast of future prices of natural**
15 **gas."¹⁸ Do you agree?**

16 A. Yes. During the 2007-08 time frame, natural gas production was expected to
17 decline while increased importation of gas through LNG terminals was viewed as
18 the likely solution to increasing prices and declining supply. For example, an
19 April 2008 report from the National Energy Technology Laboratory on behalf of
20 the Department of Energy forecast foresaw a decline in U.S. gas production of
21 almost 2 Tcf per year (or approximately 10 percent from 2007 to 2015.)¹⁹ The
22 significant drops in gas and electricity demand that resulted from the financial

¹⁷ Staff/300, Durrenberger/10.

¹⁸ Staff/300, Durrenberger/8.

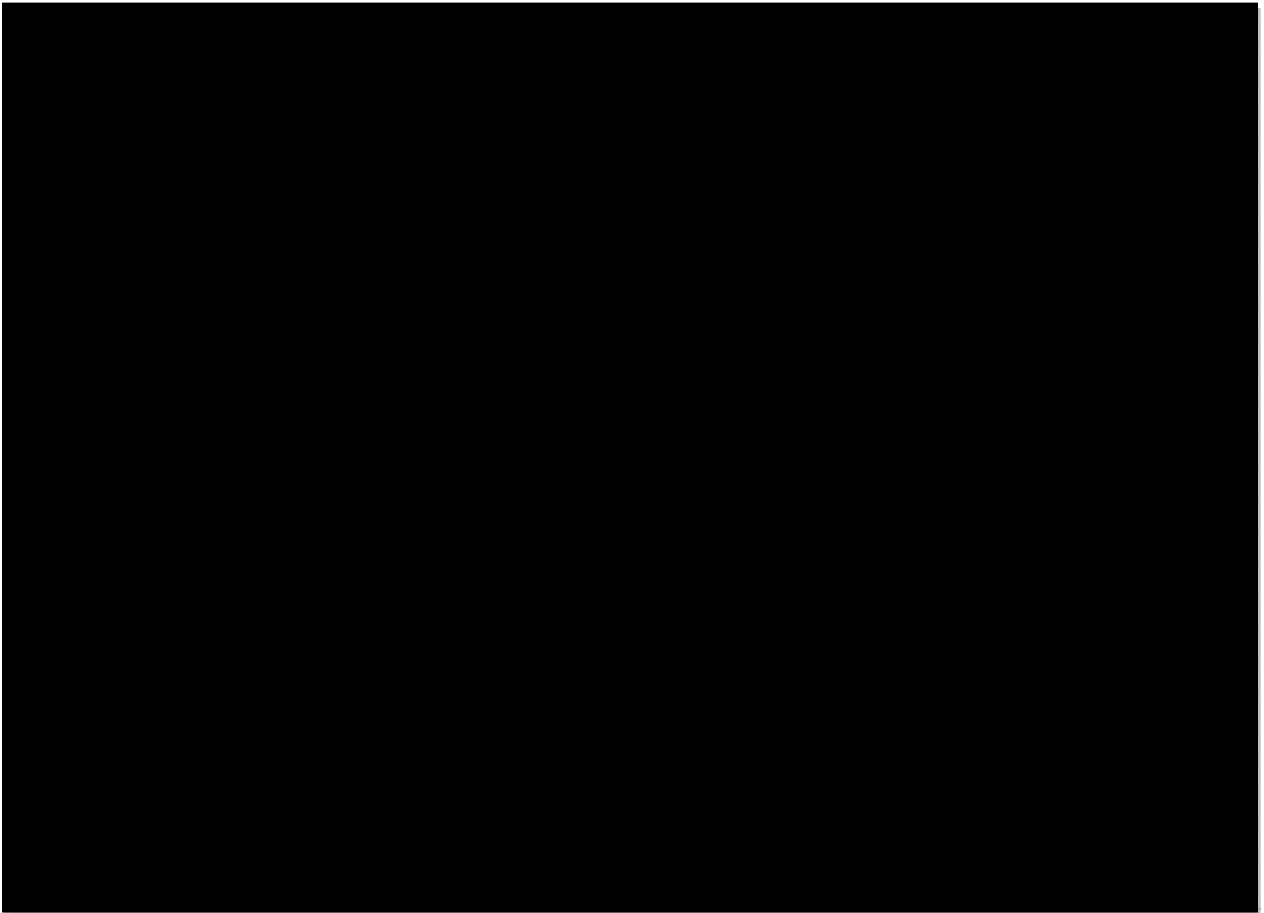
¹⁹ DOE / NETL-2008/1320, "Natural Gas and Electricity Costs and Impacts on the Industry," Figure 1.

1 crisis and recession, as well as the rapid emergence of inexpensive shale gas that
2 supplanted these prior expectations by 2009 and beyond were not foreseen or
3 foreseeable at the time of the hedges in dispute in this case.

4 The fact that the market expected natural gas prices to rise or remain high
5 is illustrated by the series of forward price strips shown in Figure FCG - 1. This
6 shows that from approximately October 2007 to July 2008, PacifiCorp was
7 looking at steadily increasing forward prices from that time through to 2011-12
8 deliveries. For instance, in Figure FCG – 1 the forward price curve as of
9 November 2007 (green) is above the October 2007 strip (black), and the strip as
10 of April 2008 (red) is above the November 2007 curve. July 2008 (purple) is yet
11 higher, and it represents the peak after which the forward price of natural gas
12 starts to decline.²⁰ This pattern of rising forward natural gas prices indicates
13 market concerns about supply adequacy were growing stronger, which in turn
14 supports long term forward hedging. In fact, the rise in forward prices means that
15 hedges entered in late 2007 were generally cheaper than hedges entered over the
16 first six months of 2008. Certainly, there was no evidence of a pending decline in
17 gas prices in the forward curve until after July 2008.

²⁰ See also the illustration of the development in forward prices in Figure 3 of PPL/400, Bird/32.

Figure FCG - 1



1 **Q. Did the volatility of gas prices evolve in a similar way throughout this time**
2 **frame?**

3 Yes. In addition to the forward price curve for natural gas increasing until mid-
4 2008, volatility was also increasing. In fact, natural gas volatility rose for more
5 than a year longer, through late 2009. This is evident in broker quotes (obtained
6 from the Company) on volatilities associated with each future delivery month for
7 each forward price curve from the fall of 2007 to the present. Brokers' quoted
8 volatilities are derived from (or implied by) a standard financial model, the Black-

1 Scholes option model for pricing options on gas futures.²¹ Volatility, usually
2 expressed as the annualized standard deviation of prices, is a measure of how far
3 from its expected value the price could become by the time the option has to be
4 exercised. The larger the volatility, the higher the prices will be, and vice versa
5 (everything else being equal). Thus, if we know the forward price of natural gas
6 and the prices of options for that same time of delivery, we can derive the implied
7 volatility.

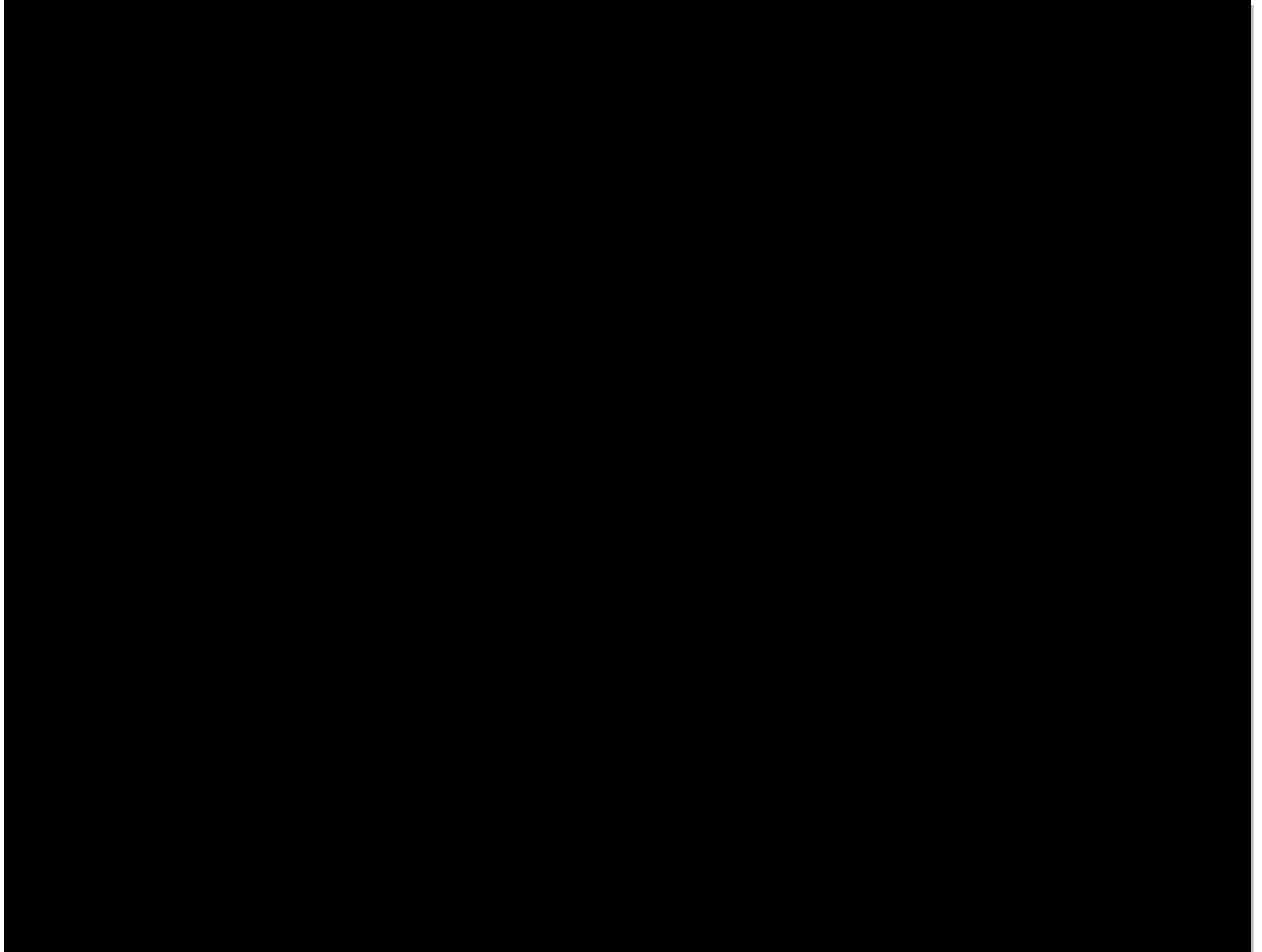
8 **Q. What do volatility quotes look like?**

9 A. They are quoted as a percentage price uncertainty for each future month, where
10 each value represents the standard deviation of how much that month's forward
11 price currently tends to change per day in percentage (scaled up to an annualized
12 equivalent value). There is a different percentage for each forward month, and
13 the overall pattern of these monthly percentages is called the volatility term
14 structure. The typical volatility term structure declines as the time to delivery
15 increases, so that the short-term volatility is larger than the long-term (far out)
16 volatility. This pattern is observed because short term risk factors (such as
17 weather) often do not have much influence on long term expectations or risks. In
18 addition, the term structure of volatility typically exhibits seasonal effects. I
19 estimate the short-term, long-term and seasonal coefficients that best fit the
20 quoted volatility data from the Company. The technical detail of the estimation is
21 in Confidential Exhibit PPL/702 (Appendix A) to this testimony. Figure FCG – 2

²¹ The Black-Scholes formula is a widely used mathematical (and equilibrium economic) relationship between the forward price of a security or commodity like natural gas, the current spot price, time to delivery, and the volatility of the price.

1 below shows an example of the quoted (black line) and fitted (red line) volatility
2 describing market expectations as of October 2007.

Figure FCG - 2



3 I will focus on how these fitted parameters changed over the time frame from
4 mid-2007 to late 2009 in my analysis of risk expectations facing PacifiCorp.

5 **Q. How do you use the fitted volatility?**

6 A. At each point in time, when PacifiCorp entered a hedge, the volatility conditions
7 foreseen in the market would have shifted. For instance, the volatility quotes seen
8 above in Figure FCG – 2 for October 1, 2007 were no longer applicable to the
9 market in the subsequent months. Some examples of how volatility changed over

1 time are seen in Figure FCG – 3 below.

Figure FCG - 3



2 To see if there is any general trend in such curves, I obtained a series of monthly
3 updates to quoted volatilities from June 2007 through December 2009, for each of
4 which I estimated the short-term, long term as well as monthly seasonality
5 coefficients going forward for each transaction date. From this, I could observe
6 how the volatility facing the Company was changing over time. The result is
7 shown in Figure FCG – 4.

Figure FCG - 4



1 This figure clearly shows that both short and long term volatility rose, albeit
2 unevenly, throughout almost all of this two year period. Indeed, short run
3 volatility more than doubled, while the long term grew by a few percent.

4 **Q. What are the implications of this price and volatility history for gas hedging**
5 **practices throughout this timeframe?**

6 A. Figures FCG – 1 and FCG - 4 demonstrate why it was reasonable for PacifiCorp
7 to have hedged long-dated delivery periods throughout 2007, 2008 and 2009. The
8 market forward curves in mid-07 through mid-08 were rising, while market
9 volatility was rising for longer, from mid-07 to late '09. Therefore, long-dated
10 hedges struck in late 2007 and early 2008 were increasingly in-the-money for

1 several months after they were struck, and they helped avoid growing market
2 volatility for nearly two more years. I note that this reduction in exposure to
3 growing market volatility goes well beyond the time when the forward hedges
4 would have been struck had the company entered into only 48 months long
5 contracts.

6 Even though prices fell once the financial crisis began, there is no
7 evidence that the natural gas market foresaw the large drop in natural gas prices.

8 **Conclusion**

9 **Q. Given the disagreements with ICNU and to a lesser extent with CUB over the**
10 **desirable extent and horizon of hedging to use, and the lack of a shared**
11 **concept of prudence, how would you suggest these tensions be resolved?**

12 A. Staff has suggested that PacifiCorp engage stakeholders in workshops that review
13 the Company's hedging policy and provide input to the Company.²² I agree with
14 this suggestion. Workshops could be used to achieve a common understanding of
15 the tradeoffs among benefits, costs, and risks, as well as constraints on alternative
16 types and degrees of hedging. These could lead to an agreed upon set of goals,
17 hedging practices, reporting, and standards of regulatory review.

18 **Q. Does this conclude your testimony?**

19 A. Yes.

²² Staff/300, Durrenberger/12.