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STEVE CRISAFULLI
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September 23, 2015

Ms. Carlotta Stauffer, Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, Florida 32399-0850

Re: Docket No. 150001-EI

Dear Ms. Stauffer:

Please find enclosed for filing in the above referenced docket the Direct Testimony and Exhibits of Daniel J. Lawton. This filing is being made via the Florida Public Service Commission's Web Based Electronic Filing portal.

If you have any questions or concerns; please do not hesitate to contact me. Thank you for your assistance in this matter.

Sincerely,

A handwritten signature in blue ink, appearing to read "Erik L. Saylor".

Erik L. Saylor
Associate Public Counsel

ELS:bsr
cc: All parties of record

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a true and correct copy of the foregoing DIRECT TESTIMONY AND EXHIBITS OF DANIEL J. LAWTON has been furnished by electronic mail on this 23rd day of September, 2015, to the following:

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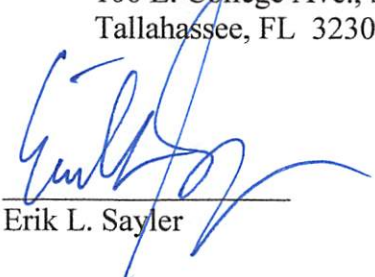
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Erik L. Saylor

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

**IN RE: Fuel and purchased power cost
recovery clause with generating
performance incentive factor**

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Docket No. 150001-EI

**DIRECT TESTIMONY AND EXHIBITS
OF
DANIEL J. LAWTON**

ON BEHALF OF THE OFFICE OF PUBLIC COUNSEL

SEPTEMBER 23, 2015

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DJL-7	Monthly Natural Gas Analysis (2007 – 2010)
DJL-8	Monthly Natural Gas Analysis (2011 – 2015)
DJL-9	Analysis of Absolute Price Changes (1997 – 2015)

1 **DIRECT TESTIMONY**

2 OF

3 **DANIEL J. LAWTON**

4 On Behalf of the Office of Public Counsel

5 Before the

6 Florida Public Service Commission

7 Docket No. 150001-EI

8 **SECTION I: INTRODUCTION/BACKGROUND/SUMMARY**

9 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

10 **A.** My name is Daniel J. Lawton. My business address is 12600 Hill Country Blvd, Suite
11 R-275, Austin, Texas 78738.

12
13 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND WORK
14 EXPERIENCE.**

15 **A.** I have been working in the utility consulting business as an economist since 1983.
16 Consulting engagements have included electric utility load and revenue forecasting,
17 cost of capital analyses, financial analyses, revenue requirements, fuel reviews, and
18 cost of service reviews, and rate design analyses in litigated rate proceedings before
19 federal, state and local regulatory authorities, and in court proceedings. I have worked
20 with numerous municipal utilities developing electric rate cost of service studies for
21 reviewing and setting rates, including fuel clause rates and reconciliations. In addition,
22 I have a law practice based in Austin, Texas. My main areas of legal practice include
23 administrative law representing municipalities in electric and gas rate proceedings and

1 other litigation and contract matters. I have included a brief description of my relevant
2 educational background and professional work experience in my Exhibit ____
3 Schedule (DJI-1).

4

5 **Q. HAVE YOU PREVIOUSLY FILED TESTIMONY IN UTILITY RATE**
6 **PROCEEDINGS?**

7 **A.** Yes. I have previously filed testimony in Florida and a number of jurisdictions across
8 the country. A list of cases where I have previously filed testimony is included in my
9 Exhibit ____ Schedule (DJI-1).

10

11 **Q. ON WHOSE BEHALF ARE YOU FILING TESTIMONY IN THIS**
12 **PROCEEDING?**

13 **A.** I am providing analyses and testimony related to fuel hedging on behalf of the Office
14 of Public Counsel, State of Florida (“OPC”). I will review the Florida Power & Light
15 Company (“FPL”), Tampa Electric Company (“TECO”), Duke Energy Florida (“DEF),
16 and Gulf Power Company’s (“Gulf”), collectively (“the Companies”) annual fuel cost
17 recovery filings related to fuel cost hedging.

18

19 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?**

20 **A.** The purpose of my testimony in this proceeding is to address some of the economic
21 and regulatory policy issues surrounding the Companies’ proposals to continue their
22 natural gas financial hedging programs as described in their 2016 Risk Management
23 Plans. I address the historical impacts of the Companies’ hedging programs on

1 consumers and the potential impacts on consumers if the 2016 Risk Management Plans
2 are approved by the Florida Public Service Commission (“Commission”). Another
3 OPC witness, Tarik Noriega, will quantify the historical impacts of hedging on
4 consumers.

5
6 **Q. WHAT MATERIALS DID YOU REVIEW AND RELY ON FOR THIS**
7 **TESTIMONY?**

8 **A.** I have reviewed prior rate orders of the Commission, the Companies’ various filings in
9 Docket No. 150001-EI, the Companies’ filings in prior dockets, discovery responses to
10 various requests in this proceeding, along with other information available in the public
11 domain. When relying on various sources, I have referenced such sources in my
12 testimony and/or attached Schedules and included copies or summaries in my attached
13 Schedules and/or work papers.

14
15 **Q. PLEASE SUMMARIZE YOUR CONCLUSIONS REGARDING THE**
16 **REASONABLENESS OF CONTINUED FINANCIAL HEDGING.**

17 **A.** My analysis leads me to conclude that the overall costs of the natural gas financial
18 hedging programs exceed the benefits to consumers. Therefore, I recommend that, on
19 a prospective basis, the proposed continuation of gas hedging activities should be ended
20 as a mechanism to limit gas (fuel) price volatility, and that the 2016 Risk Management
21 Plans proposed by the Companies regarding future financial hedging proposals should
22 not be approved by the Commission for the following reasons:

1 1. There is significant doubt as to the benefits of fuel hedging given the
2 historical, ongoing, and potential financial costs to consumers;

3
4 2. From 2009 to 2014, significant hedging losses were experienced in five of
5 the six years; and current estimates by the Companies indicate 2015 to be
6 another year of hedging losses, making it six out of the last seven years with
7 hedging losses;

8
9 3. The amount of hedging losses or “costs” passed on to consumers in the form
10 of higher-than-market price fuel costs has been substantial with hedging costs
11 (or higher-than-market fuel costs) amounting to a staggering \$2.5 billion
12 between 2011 and the estimated 2015 year;

13
14 4. Natural gas markets in terms of gas production and market supply have
15 changed substantially in recent years reducing the probability and extent of
16 significant supply-side market disruption and also reducing natural gas price
17 volatility relative to past years;

18
19 5. Regulatory authorities are recognizing the limitations of financial hedging
20 in the changed natural gas markets; and

21
22 6. The current fuel factor design and mechanism in Florida already adequately
23 mitigates fuel cost volatility without the need and cost risk of financial hedging.

1 **Q. PLEASE PROVIDE A BRIEF SUMMARY OF YOUR CONCLUSIONS.**

2 **A.** Since the early 2000 time period, when gas markets experienced substantial volatility
3 and price spikes for natural gas due to supply constraints along with adverse weather
4 impacting natural gas demand, market conditions particularly the supply of natural gas
5 have changed substantially. Annual gas production has grown dramatically and
6 available gas reserves are well beyond forecasted levels from even ten years ago. As a
7 result, price levels have declined substantially and price volatility is substantially
8 reduced from past levels. Moreover, current forecasts of gas market prices indicate
9 stable gas prices in the near-term, mid-term, and longer-term time horizon. The recent
10 market experience since 2011 and the current market forecasts for natural gas all
11 indicate that volatility is declining, natural gas prices are more stable, and the facts and
12 circumstances that once supported natural gas hedging as a tool to limit price volatility
13 are no longer present. Further, there are available, transparent, cost-free opportunities
14 to limit price volatility impacts on consumers going forward through the fuel
15 adjustment clause. Given the enormous lost-opportunity costs experienced by
16 consumers in terms of overall fuel costs, and the potential for additional lost
17 opportunities for lower gas costs under the status quo hedging and risk management
18 plans, financial hedging of natural gas should be ended at this time.

19

20 For all the above reasons, I recommend the Commission deny the 2016 Risk
21 Management Plans submitted by the Florida Companies and that financial hedging of
22 natural gas should be discontinued.

1 **SECTION II: SUMMARY OF ISSUES ADDRESSED**

2 **Q. WHAT ISSUES DO YOU ADDRESS WITH REGARD TO THE FLORIDA**
3 **COMPANIES' PROPOSALS TO CONTINUE HEDGING NATURAL GAS**
4 **PURCHASES THROUGH THE VARIOUS RISK MANAGEMENT PLANS?**

5 **A.** I first provide a brief summary of the historical financial hedging position of the Florida
6 Companies. OPC witness Noriega addresses the history of the fuel adjustment clause
7 and hedging in his testimony, and the amount of historical hedging losses experienced.
8 My analysis of the financial hedging history examines these historical results from a
9 statistical and volatility metric perspective;

10

11 Second, I address the natural gas market changes that have impacted natural gas market
12 supply, prices, and market volatility;

13

14 Third, I address how the natural gas market results, related to declining gas price
15 volatility in recent years, are tied to market changes making financial hedging in natural
16 gas less effective;

17

18 Fourth, I address how regulatory authorities around the country are beginning to
19 recognize that financial hedging of natural gas is not beneficial to consumers; and

20

21 Fifth, I address how the existing fuel factor mechanism addresses price volatility issues.

22 I also address previously proposed changes that, if adopted, address fuel price volatility
23 without the unnecessary cost or risks of financial hedging.

1 These issues and topics are addressed in the following testimony to arrive at a
2 recommendation in this case.

3

4 **SECTION III: HISTORICAL OVERVIEW OF NATURAL GAS HEDGING**

5 **Q. BEFORE GETTING INTO THE HISTORICAL OVERVIEW OF HEDGING,**
6 **PLEASE DESCRIBE AND DEFINE NATURAL GAS PRICE HEDGING.**

7 **A.** Natural gas price hedging is an action or economic activity intended to reduce price
8 fluctuations or volatility. Hedging accomplishes the goal of reducing price volatility
9 by locking in the future price to be paid ahead of time rather than subjecting future fuel
10 purchases to the day-to-day price changes in the market place. The simplest form is an
11 action taken to insure against price volatility risk. A natural gas hedge can be a physical
12 or financial hedge. An example of a hedge is the purchase of a future gas quantity at a
13 fixed price. Thus, no matter what the future market price, this pre-purchased gas
14 quantity is hedged or locked-in.

15

16 A hedge is analogous to an insurance policy that protects against future price changes
17 and volatility. It is important to note that the hedged or locked-in price assured by the
18 hedge may be higher or lower than the future gas market price at the time the
19 commodity is needed and consumed. In other words, hedges are not designed to beat
20 the future market prices. Instead, hedging programs are designed to lock down prices
21 and avoid the day-to-day volatility in market prices. However, when the sole purpose
22 is to mitigate price volatility, then there is no built-in ability to capture any of the
23 benefits associated with declining fuel prices on the hedged portion of natural gas.

1 The Commission has previously provided guidance as to a definition of financial
2 hedging as follows:

3 Financial hedging is a term used to describe the purchase or sale of an
4 exchange-traded futures or options contract with the specific intent of
5 protecting an existing or anticipated physical market position from
6 unexpected or adverse price fluctuations.¹

7 Financial hedging of fuel purchases has been defined and employed in Florida as a tool
8 in the fuel procurement process for a significant period of time.

9

10 **Q. DO HEDGING PROGRAMS HAVE COSTS?**

11 **A.** Yes. There are two types of hedging costs. First, there is the cost of running a hedging
12 program in terms of labor of staff dedicated to implementing the hedging program.
13 These hedging program costs are generally not large.

14

15 Second, there are opportunity costs associated with hedging. With the purchase and
16 sale of various hedging instruments relative to ultimate market prices, there are
17 opportunity costs (losses) when the market price settles lower than the hedged price,
18 and benefits (savings or gains) when the market price settles higher than the hedged
19 price. By locking in a future price through hedging instruments, consumers lose the
20 benefit of lower market prices when the hedged or locked in price is lower than the
21 market price. These hedged natural gas prices versus market prices are the key

¹ “Notice of Proposed Agency Action Order Finding Florida Power & Light Company Took Reasonable Steps To manage The Risks Associated With Changes In Natural Gas Prices For The Period March 1999 Through March 2001”, Order No. PSC-02-0793-PAA-EI, issued June 11, 2002, in Docket No. 011605-EI, In re: Review of Investor-owned electric utilities’ risk management policies and procedures, at 3.

1 opportunity costs associated with hedging that need to be evaluated when assessing the
2 benefits and need of hedging future natural gas purchases.

3

4 As used in my testimony, “hedging cost” or “hedging loss” refers to these opportunity
5 costs associated with hedging and not the costs to run or administer a Company’s
6 hedging program.

7

8 **Q. DO THE DAILY NATURAL GAS PRICE CHANGES (PRICE VOLATILITY)**
9 **DIRECTLY AND IMMEDIATELY IMPACT RATES PAID BY FLORIDA**
10 **CONSUMERS?**

11 **A.** No. The day-to-day changes in natural gas prices (price volatility) do not directly and
12 immediately have an impact on the monthly rates consumers pay in their monthly
13 electric bills. This is because of the manner in which the Commission establishes the
14 annual fuel factor in the annual fuel adjustment clause proceeding (A/K/A “Fuel
15 Docket”). The fuel portion of the utility bill is estimated annually based on projected
16 sales of electricity, fuel quantities needed for electric generation, fuel prices, and prior
17 over/under recoveries – all to establish a fuel factor to be applied to the kilowatt
18 consumption of consumer bills. Once established by the Commission, the fuel factor
19 stays in place until changed by the agency at some future date.

20

21 Fuel factors are reviewed and changed at least on an annual basis. A more frequent
22 fuel factor review is also possible through what is referred to as a mid-course correction
23 as discussed below.

1 The fuel factor mechanism in Florida is similar to what many regulatory jurisdictions
2 employ regarding establishing tariffs for future unknown fuel costs, collecting fuel
3 costs, and addressing material changes in fuel costs during the collection period.

4
5 While day-to-day changes in market fuel prices (price volatility) do not alter the fuel
6 factor, the cumulative effect of unexpected changes in market prices could have the
7 effect of creating the need for a mid-course correction in the fuel factor because the
8 materiality threshold is met due to the unexpected price changes. In other words, if the
9 current fuel factor is determined to materially over/under collect fuel costs, then the
10 utility is required to notify the Commission. Depending on the circumstances
11 surrounding the material recovery deficiency, a new fuel factor may be established and
12 charged to consumers to address fuel cost recovery.

13
14 Thus, while changes in commodity price levels (up or down) certainly will affect future
15 fuel factor calculations, there is no direct and immediate impact of this price fluctuation
16 on consumers' rates while a fuel factor is in place. However, to the extent fuel price
17 volatility creates a material change in fuel costs (generally 10% over/under recovery of
18 fuel costs), then a mid-course correction in fuel charges could be required.

19 **Q. IS THERE A HEDGING COST REASON OR CONSIDERATION FOR THE**
20 **COMMISSION TO REVISIT HEDGING PROGRAMS?**

21 **A.** Yes. In 2008, the Commission stated "Hedging program[s] are designed to assist in
22 managing the impacts of fuel price volatility. Within any given calendar period,
23 hedging can result in gains or losses. *Over time, gains and losses are expected to offset*

1 *one another.*”² (emphasis added). Since 2008, high levels of losses or lost
2 opportunities, related to lower market prices relative to the hedged payment that have
3 been part of a continuing trend over time, have resulted and should raise a red flag
4 concerning the continuation of the hedging program and the costs borne by customers.
5 Regulatory authorities should expect to see some losses in hedging for some years and
6 possibly most years given ongoing program costs and the fact that financial hedging,
7 like insurance protection, for price stability is not free. However, large and prolonged
8 hedging losses should signal a re-evaluation of hedging programs in order to stem the
9 tide of losses and costs to consumers.

10

11 **Q. PLEASE PROVIDE AN HISTORICAL OVERVIEW OF NATURAL GAS**
12 **HEDGING COSTS TO CONSUMERS.**

13 **A.** Historical hedging costs of the Companies are being addressed in the testimony of OPC
14 witness Tarik Noriega. Also, a review of earlier year historical hedging in Florida has
15 been addressed and described in the Commission Staff’s review of “Fuel Procurement
16 Hedging Practices of Florida’s Investor-Owned Electric Utilities” at
17 www.floridapsc.com/publications/pdf/electricgas/HedgingPracticesIOUs.pdf (June
18 2008). Since the Commission Staff’s June 2008 analysis, the utility companies in
19 Florida have collectively missed out on substantial lower gas cost opportunities due to
20 fuel hedging activities required by their Risk Management Plans every year for 2009
21 through 2015, except in 2014. The following table summarizes the Companies’ annual

² Order No. PSC-08-0030-FOF-EI, at 4, issued January 8, 2008, in Docket No. 070001-EI, In re: Fuel and purchased power cost recovery clause with generating performance incentive factor.

1 hedging opportunity costs (losses) for 2011 through 2015³:

2 **Table-1⁴**

3 **Historic Hedging Opportunity Costs to Florida Customers**

YEAR	HEDGING OPPORTUNITY LOSSES
2011	(\$694,455,607)
2012	(\$1,117,525,079)
2013	(\$140,565,299)
2014	\$106,424,864
2015	(\$646,050,220)
Total 2011-2015	(\$2,492,171,341)

4

5 The hedging activities of the Florida Companies have cost consumers in terms of
6 higher-than-market fuel costs every year except 2014. More recent hedging activities
7 (since 2011) show substantial and mounting losses associated with fuel-related
8 opportunity costs as a result of financial hedging.

9

10 While recent hedged prices may be locked-in and are not as volatile as market prices,
11 the question before the Commission is whether the cost of the price stability - that is,

³ The 2015 projected loss data is based on the Florida utilities' estimates of hedging losses provided in response to OPC's First Set of Interrogatories to Duke, Gulf, and TECO No. 5; and OPC's Fourth Set of Interrogatories to FPL No. 29.

⁴ The Hedging Opportunity Losses are taken from the Responses to OPC's First Set of Interrogatories to Duke No. 2, To Gulf No. 2, To TECO No. 2, and OPC's Fourth Set of Interrogatories to FPL No. 26.

1 the elimination of price volatility, which cost consumers about \$2.5 billion in lost
2 market opportunities and higher gas prices since 2011 - is justified. Given current gas
3 markets and current projections the answer to the question is: No.

4
5 Prices in the natural gas markets are declining. Volatility in gas prices is declining.
6 There is just no basis to conclude that consumers should be paying substantially higher-
7 than-market prices for natural gas to limit volatility when market evidence indicates
8 volatility is declining and eliminating the need for hedging. Moreover, what price
9 volatility impacts on consumers remain in today's environment are already mitigated
10 through the Commission's fuel clause mechanism without financial hedging and its
11 associated costs and risk to consumers.

12
13 **Q. YOU USE THE TERM PRICE VOLATILITY IN CONJUNCTION WITH**
14 **YOUR DISCUSSION OF HEDGING. WHAT IS PRICE VOLATILITY?**

15 **A.** Generally speaking, price volatility is a broad and relatively loosely defined term. Price
16 volatility speaks to changes in market prices; however, the impact and degree of
17 volatility on market participants can vary substantially depending upon the geographic
18 market or time interval of prices examined. For example, hourly price changes are
19 different from daily, weekly, monthly, or annually averaged price changes.

20
21 Given that price volatility is not a precisely defined term, the measurement of price
22 volatility can be subject to different approaches. For example, price volatility can be
23 measured based on changes in the absolute value of price changes. This measure is

1 what one finds each day in the business reporting of price changes in markets. Absolute
2 energy average price changes showing rapid and/or unanticipated change reflect a
3 volatile market.

4 Another measure of volatility is viewed in terms of return, or the change in price
5 relative to a previous price. These return measures of volatility measure the percentage
6 change in price rather than the absolute value price increment described above. Thus,
7 a 10 percent change is the same whether measured from a \$0.20 increase from \$2.00
8 per MMBtu, or a \$1.00 increase from \$10.00 per MMBtu.

9

10 **Q. DO PRIOR COMMISSION ORDERS HELP IN DEFINING FUEL PRICE**
11 **VOLATILITY?**

12 **A.** No. Volatility is only defined generically. For example, in the “Order Approving
13 Resolution of Issues” the Commission’s Order No. PSC-02-1484-FOF-EI, in Docket
14 No. 011605-EI, dated October 30, 2002, the proposed resolution of issues states the
15 following:

16 Each investor-owned electric utility recognizes the importance of
17 managing price volatility in the fuel and purchase power it purchases to
18 provide electric service to its customers. Further, each investor-owned
19 electric utility recognizes that the greater the proportion of a particular
20 fuel or purchased power it relies upon to provide electric service to its
21 customers, the greater the importance of managing price volatility
22 associated with that energy source.⁵

⁵ Order No. PSC-02-1484-FOF-EI, issued October 30, 2002, in Docket No. 011605-EI, In re: Review of investor-owned electric utilities’ risk management policies and procedures, at Attachment A “Components of Proposed Resolution, paragraph 1.

1 Thus, while the Commission points out the importance and potential impact of price
2 volatility on electric consumer rates, no general or specific approaches to identifying
3 and/or measuring price volatility are provided.

4

5 **Q. DO THE FLORIDA COMPANIES PROVIDE AN APPROACH TO**
6 **CALCULATING PRICE VOLATILITY?**

7 **A.** Yes. The following was provided by each of the Florida Companies regarding price
8 volatility:

9 FPL: Volatility, as it relates to fuel prices, is a statistical measure of the
10 variation in prices over time. Historical volatility for natural gas is
11 measured by taking the standard deviation of the historical, measured
12 day-to-day percentage deviations of the forward curve.⁶

13 TECO: Tampa Electric measures variability and/or volatility of fuel
14 costs primarily through standard deviation. Standard deviation is a
15 common, mathematically sound means for assessing the variation in a
16 set of values relative to the mean of that set of values.⁷

17 DEF: There are two general methods for estimating volatility. One
18 involves calculating the standard deviation of changes in historical
19 prices, and the other derives the implied volatility using market prices
20 of traded options. The Company uses the latter approach which
21 provides the Company with observed market volatility which is the
22 volatility that is trading in the market at a point in time and the market's
23 view of uncertainty in future prices.⁸

24 Gulf: [Both] the variance and standard deviation of hedged and
25 unhedged natural gas prices are calculated based on monthly values over
26 a period of twelve months.⁹

⁶ FPL response to OPC's 10th Set of Interrogatories, Interrogatory No. 115.

⁷ TECO Response to OPC's 3rd Set of Interrogatories, Interrogatory No. 39.

⁸ DEF response to OPC's 3rd Set of Interrogatories, Interrogatory No. 40.

⁹ Gulf Response to OPC's 3rd Set of Interrogatories, Interrogatory No. 40.

1 While there are differences in each of the Company's volatility estimates, all measures
2 use a mathematical measure of dispersion variance and/or standard deviation applied
3 to historical prices or prices of traded options.

4
5 As I discuss below, my review and analysis examines historical volatility in natural gas
6 markets employing standard deviation utilizing daily, monthly, and annual data. These
7 analyses demonstrate that volatility, as a measure of changes in gas market prices, is
8 declining which is consistent with the significant market supply changes in the natural
9 gas markets resulting from increased shale development since approximately 2007 –
10 2008. These analyses also show that price volatility concerns arose in the early 2000
11 period, when price hedging was viewed as a necessary mechanism by regulatory
12 authorities in Florida and around the country for controlling fuel price changes, are no
13 longer necessary given natural gas market changes.

14

15 **SECTION IV: FLORIDA COMPANIES' HISTORICAL AND FUTURE HEDGING**

16 **Q. PROVIDE AN OVERVIEW OF WHAT THE FLORIDA COMPANIES ARE**
17 **PROPOSING WITH REGARD TO FUTURE NATURAL GAS HEDGING.**

18 **A.** A review of each Company's Risk Management Plan indicates more of the same of
19 what was done in the past. In other words, there is no substantial change in their
20 approaches to hedging. However, one difference is the provision that FPL will now
21 incorporate the Woodford Project as part of its overall natural gas hedged quantities.
22 Historically, substantial quantities of the expected natural gas burn quantities for each
23 Company have been hedged. DEF, Gulf, and TECO provided their historical

1 percentage of volume hedged to fuel consumed for the period 2002 to 2014.¹⁰ Since
2 2010, these Companies have hedged from a low of 33% for Gulf in 2010 to a high of
3 72% for TECO in 2014. According to a recent news article, FPL hedges about 60% of
4 its fuel purchases.¹¹ Despite incurring enormous hedging costs (losses) since 2011, no
5 major changes are described or proposed in the 2016 utility hedging plans for the future.

6

7 The obvious problem with the Florida Companies' "more of the same" approach with
8 regard to hedging is that such approaches have generated cumulative losses exceeding
9 \$1.8 billion for the period 2011 through 2014.¹² The recent 2015 hedging efforts are
10 expected to produce additional opportunity costs to customers of approximately \$646
11 million.¹³ Continuing to implement the same hedging practices, without modification
12 and despite the paradigm shift in the natural gas markets, are likely to bring consumers
13 more of the same lost opportunities in terms of overall fuel costs.

14

15 **Q. WHEN DID THE FLORIDA COMPANIES BEGIN NATURAL GAS**
16 **HEDGING?**

17 **A.** Based on a review of the discovery in this case, most risk management hedging efforts
18 began in the 2001 to 2002 timeframe.¹⁴ Given the starting date, my analyses of gas
19 markets and volatility issues will cover the period 2000 through the present.

¹⁰ See DEF's, Gulf's, and TECO's Responses to OPC's 5th Set of Interrogatories, Interrogatory No. 71.

¹¹ "FPL says customers to save more in 2016 from utility's efficiency push" by Susan Salisbury, Palm Beach Post, September 2, 2015, available at <http://www.mypalmbeachpost.com/news/business/fpl-says-customers-to-save-more-in-2016-from-utili/nnXKW/>. Note: FPL's actual historical percentage of volume natural gas hedged to fuel consumed is confidential. See FPL's Response to OPC's 13th Set of Interrogatories, Interrogatory No. 148.

¹² See Table 1.

¹³ *Id.*

¹⁴ See TECO Response to OPC 3rd Set of Interrogatories, Interrogatory No. 37, DEF Response to OPC 3rd Set of

1 **Q. WHAT ARE THE STATED GOALS OF THE FLORIDA COMPANIES’**
2 **HEDGING PROGRAMS?**

3 **A.** Based on a review of the discovery in this case, most risk management hedging
4 objectives are to reduce fuel price volatility over time and to provide a greater degree
5 of fuel price certainty.¹⁵ FPL also notes that the “... goal is to execute a well-managed,
6 non-speculative hedging program that is not intended to reduce fuel costs paid over
7 time, but rather reduce the variability or volatility in fuel costs paid by customers over
8 time.”¹⁶ Thus, the overriding concern in the risk management hedging programs (at
9 least for FPL) is to limit fuel price variability impacts (volatility) and not fuel costs.
10 Given the Companies’ fuel price variability concerns, a significant factor in the hedging
11 evaluation to be considered is whether price volatility concerns and issues are as
12 important today as they have been in the past. It is also important to consider ongoing
13 losses and the impact to consumers of paying substantially higher prices for fuel costs,
14 especially if limiting potential fuel price volatility provides diminished and declining
15 benefit. For example, if natural gas markets have expanded gas supply and the
16 probability of market disruption is decreased, making unexpected price changes and
17 spikes less and less likely, it may not make much sense to incur hundreds of millions
18 of dollars in hedging costs through higher-than-market, locked-in or hedged, fuel costs.

Interrogatories, Interrogatory No. 37, FPL Response to OPC 10th Set of Interrogatories, Interrogatory No. 113, and Gulf Response to OPC 3rd Set of Interrogatories, Interrogatory No. 37. *See also* Order No. PSC-02-1484-FOF-EI, issued October 30, 2002, in Docket No. 011605-EI, In re: Review of investor-owned electric utilities’ risk management policies and procedures.

¹⁵ See TECO Response to OPC 3rd Set of Interrogatories, Interrogatory No. 38, DEF Response to OPC 3rd Set of Interrogatories, Interrogatory No. 38, FPL Response to OPC 10th Set of Interrogatories, Interrogatory No. 114, and Gulf Response to OPC 3rd Set of Interrogatories, Interrogatory No. 38.

¹⁶ See FPL Response to OPC 10th Set of Interrogatories, Interrogatory No. 114.

1 **Q. HOW DO THE FLORIDA COMPANIES EVALUATE EXPECTED PRICE**
2 **VOLATILITY EACH YEAR TO DETERMINE THE EXTENT AND LEVEL**
3 **OF HEDGING IN THEIR RESPECTIVE RISK MANAGEMENT**
4 **PROGRAMS?**

5 **A.** The short answer is: there is no analysis or evaluation being done. Instead, at the
6 highest levels, hedging programs are implemented to limit volatility without
7 consideration of market changes and/or expectations.¹⁷ For example, on the issue of
8 considering some acceptable level of volatility, Gulf stated: “[n]o target measurement
9 of past fuel price volatility has been established that would preclude the Company from
10 financially hedging future natural gas prices.”¹⁸

11
12 DEF addressed this same issue by stating:

13 **As the Company cannot predict future prices or actual volatility**
14 **levels, defining a level of volatility that is acceptable is not possible.**
15 **What is known is that prices are constantly changing and thus by**
16 **definition contain volatility. The purpose of DEF’s hedging**
17 **program is to reduce that volatility by locking in prices.**
18 Additionally, given the continued growth in natural gas generation for
19 the Company and the State of Florida, the current level of natural gas
20 prices, and the significant portion that natural gas makes up of the
21 Company’s fuel cost, the Company believes that executing a hedging
22 program over time is a prudent risk management activity to reduce price
23 volatility and create greater fuel cost certainty for customers.¹⁹
24 (emphasis added)
25

26 It is difficult to envision something being more automatic at the macro level than DEF’s
27 hedging program described above. Certainly, it is a fact that market prices for natural

¹⁷ See generally TECO Response to OPC 3rd Set of Interrogatories, Interrogatory No. 41, DEF Response to OPC 3rd Set of Interrogatories, Interrogatory No. 41, FPL Response to OPC 10th Set of Interrogatories, Interrogatory No. 117, and Gulf Response to OPC 3rd Set of Interrogatories, Interrogatory No. 41.
¹⁸ See Gulf Response to OPC 3rd Set of Interrogatories, Interrogatory No. 41.
¹⁹ See DEF Response to OPC 3rd Set of Interrogatories, Interrogatory No. 41.

1 gas, **like all markets, are constantly changing** and, as such, subject to some level of
2 volatility. Given that the stated goal of hedging appears to be to mitigate volatility,
3 which by definition **always exists**, it appears the hedging programs continue no matter
4 the effectiveness and no matter the cost to consumers. I have found no cost/benefit
5 evaluations of the hedging programs in Florida. Instead, the sole stated goal is to
6 mitigate price volatility.

7

8 **Q. DO THE FLORIDA COMPANIES' HEDGING PROGRAMS ACCOMPLISH**
9 **THE GOAL OF LIMITING NATURAL GAS PRICE VOLATILITY?**

10 **A.** Yes, it is an automatic result. Just as daily price changes by definition create the
11 certainty of daily price volatility, locking-in and fixing future prices, rather than relying
12 on day-to-day market prices, automatically reduces volatility. However, the fact that
13 the result is automatic does not necessarily mean it is wise to hedge, especially in light
14 of the decreasing need to hedge and the increasing cost to consumers resulting from
15 automatic hedging activities.

16

17 **Q. DID DEF EVALUATE THE ECONOMIC IMPACT OF THE DEF'S**
18 **AUTOMOMATIC HEDGING ACTIVITIES FOR THE 2010 THROUGH 2014**
19 **PERIOD?**

20 **A.** DEF readily acknowledges the automatic results of hedging and states:

21 The Company's hedging plan reduces the risk of future price
22 movements for a percentage of its forecasted burns by executing fix[ed]
23 prices over time. No formal evaluation is necessary to reach this
24 conclusion because by definition fixed prices are no longer subject to
25 future price movements and as a result volatility and fuel cost price risk

1 have been mitigated. ... DEF's hedging activities do not attempt to
2 outguess the market and may or may not result in net fuel cost savings.²⁰
3

4 DEF readily admits that the results of its hedging program are automatic, and no
5 consideration of whether hedging is necessary, or cost effective for consumers, is ever
6 undertaken.

7 Further, DEF addresses the fact that it ignores cost effectiveness considerations by
8 stating:

9 ... the purpose of hedging is to reduce the variability or volatility of fuel
10 costs paid by customers over time and hedging does not involve
11 speculating or attempting to anticipate the most favorable point in time
12 to place hedges. Moreover, it is recognized that hedging can result in
13 significant lost opportunities for savings in fuel costs paid by customers,
14 and to balance the goal of reducing customers' exposure to rising fuel
15 prices against the goal of allowing customers to benefit from falling
16 prices, the Commission has recognized that it is appropriate to hedge
17 only a portion of the total expected volume of fuel purchases.²¹
18

19 Hedging has the singular purpose of limiting or reducing price volatility without regard
20 as to whether volatility is high, low, increasing, or declining. For example, under the
21 DEF approach, prices can be expected to decline substantially, yet according to DEF,
22 for some reason volatility in the price decline must be addressed by hedging and
23 locking in future prices, thus risking the declining fuel cost benefit to consumers.
24

25 **Q. ARE THERE ANY LIMITATIONS ON HEDGING IN THE RISK**
26 **MANAGEMENT PLANS YOU EVALUATED?**

27 **A.** The only limitation on hedging is to hedge less than 100 percent; however, even the
28 percentage to hedge does not appear to be supported by any market analysis. There is

²⁰ See DEF Response to OPC 3rd Set of Interrogatories, Interrogatory No. 47.

²¹ *Id.*

1 no consideration of changes in the market or any evaluation of the cost of hedging on
2 consumers. Instead, the goal is to mitigate volatility (whether volatility is a problem
3 or not) and hedge less than 100 percent of fuel requirements to reduce the adverse
4 impacts of lost fuel opportunity costs.

5
6 **Q. DID TECO EVALUATE THE ECONOMIC IMPACT OF THE TECO**
7 **HEDGING ACTIVITIES FOR THE 2010 THROUGH 2014 PERIOD?**

8 **A.** Yes, but only in part. TECO provided the economic impact of its hedging by stating:

9 For 2010 through 2014, financial hedging of natural gas prices has
10 lowered the standard deviation from 19 percent for monthly NYMEX
11 natural gas settlement prices to 18 percent for monthly-hedged natural
12 gas prices.²²
13

14 Absent from TECO's hedging evaluation of a one percent decline in volatility is the
15 fact that TECO consumers lost about \$150.9 million in lower fuel costs because of the
16 hedges during the 2010 through 2014 period.²³ The effect of limiting volatility by one
17 percent at a consumer cost of \$150.9 million is never considered in deciding whether
18 to hedge or even how much to hedge.

19
20 **Q. HOW DOES FPL EVALUATE THE ECONOMIC IMPACT OF ITS HEDGING**
21 **ACTIVITIES FOR THE 2010 THROUGH 2014 PERIOD?**

22 **A.** In terms of natural gas price volatility reduction during the 2010-2014 period, FPL states:

23 Through its hedging program, FPL locks in the price of a percentage of
24 its projected natural gas requirements. Having done so, it is a
25 mathematical certainty that the variability/volatility in fuel costs will be

²² See TECO Response to OPC 3rd Set of Interrogatories, Interrogatory No. 47.

²³ See TECO Response to OPC's 1st Set of Interrogatories No. 2.

1 reduced because the fixed price hedge replaces the floating market price
2 for the volume that is hedged. Therefore, the price of the hedged
3 volumes can no longer move with fluctuating market prices ...²⁴
4

5 However, FPL does not address that the consumer cost of the mathematical certainty
6 of reducing volatility reduction in natural gas prices, i.e. higher fuel cost resulting from
7 hedging, cost FPL consumers about \$1.450 billion over the 2010 to 2014 period.²⁵
8 Based upon this substantial amount of higher fuel costs alone, it is difficult to discern
9 a consumer benefit from hedging in the period since 2010.
10

11 **Q. EARLIER YOU DISCUSSED HOW THE FLORIDA COMPANIES HEDGE**
12 **LESS THAN 100 PERCENT OF THEIR FUEL REQUIREMENTS IN**
13 **RECOGNITION OF POTENTIAL LOST FUEL COST BENEFITS WHEN**
14 **MARKET PRICES ARE DECLINING. DOES THAT FACT MAKE A**
15 **DIFFERENCE IN THE HEDGING EVALUATION?**

16 **A.** No. First, there is a great deal of room between 1 percent and 100 percent hedging and,
17 unfortunately, there is no analysis or basis that I have determined, in how the ultimate
18 hedging percentage is established. For example, when gas markets have shown
19 declining volatility and increased production and reserve levels with lower overall price
20 levels (as the market exists today), one would expect to see less hedging. However,
21 the Florida Companies are hedging more than ever without regard to market conditions
22 or limited hedging needs. Further, there is no incentive to cease hedging because there

²⁴ See FPL Response to OPC 10th Set of Interrogatories, Interrogatory No. 123.

²⁵ The Hedging Opportunity Losses are taken from the Responses to OPC's First Set of Interrogatories To FPL No. 26.

1 is virtually no risk of fuel cost disallowance for any hedging decision so long as the
2 Companies follow their approved hedging plans.

3

4 **SECTION V: ANALYSIS OF HISTORICAL PRICE VOLATILITY**

5 **Q. WHAT ISSUES DO YOU ADDRESS IN THIS SECTION OF YOUR**
6 **TESTIMONY?**

7 **A.** The purpose of this part of my testimony is to review and summarize the historical
8 volatility of the natural gas markets. The period covered by the Henry Hub database I
9 employ is 1997 through July 2015. My general focus for this analysis is from January
10 2000 through July 2015. I address volatility and how it is measured along with the
11 changes in volatility in the natural gas markets over time.

12

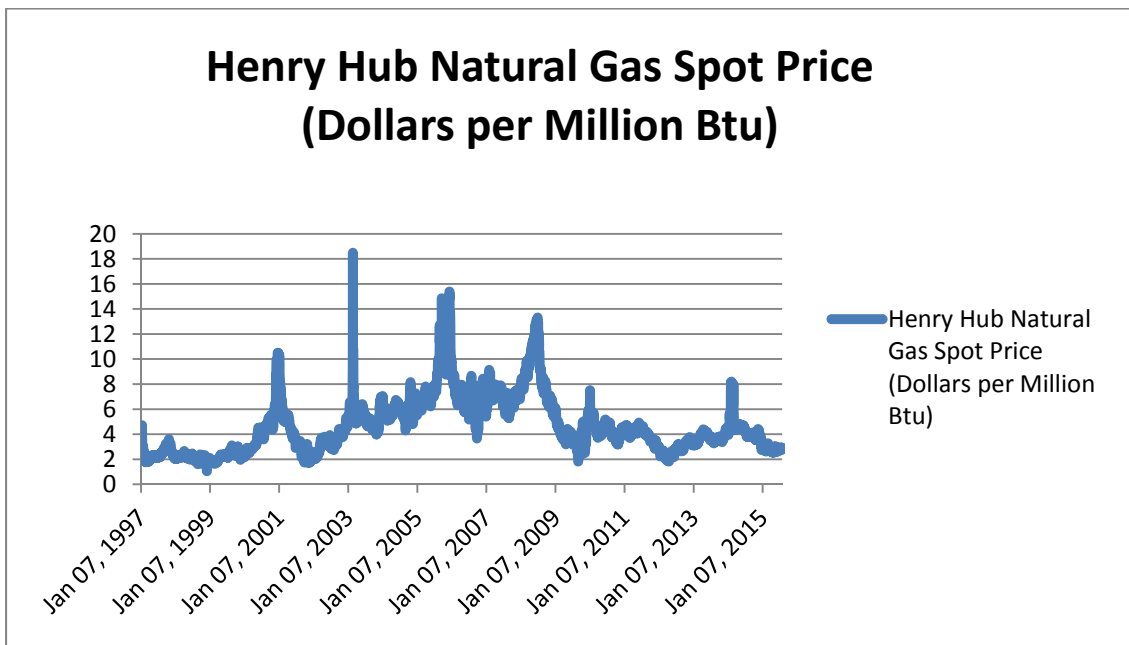
13 **Q. PLEASE EXPLAIN HOW YOU MEASURE PRICE VOLATILITY FOR YOUR**
14 **ANALYSIS.**

15 **A.** My analysis of natural gas price volatility examined the changes in market prices for
16 natural gas at the Henry Hub.²⁶ The data series of prices was extracted from the Energy
17 Information Agency's ("EIA's") historical database and covered the period January 1,
18 1997 through July 31, 2015. The data examined over this time period consisted of
19 daily, weekly, monthly, and annual natural gas price data. I have included in Table 2
20 below a graph of the Daily Henry Hub Spot Price for the period January 1997 through
21 July 31, 2015.

²⁶ The Henry Hub pipeline is the pricing point for natural gas futures on the New York Mercantile Exchange (NYMEX). The settlement prices at the Henry Hub are used as benchmarks for the entire North American natural gas market.

1 The level of prices does not determine price volatility; rather, it is the degree of price
2 variation one evaluates to determine price volatility. As shown in Table 2, from
3 January 1, 1997 through July 31, 2015, the level of prices ranges from a high of over
4 \$18.00 to a low of under \$2.00 per MMBtu, and the volatility changes substantially
5 over time. Also, the trends in prices either increasing or decreasing do not necessarily
6 indicate whether a market is volatile. Volatility is generally measured by the percent
7 changes in day-to-day prices. A large price movement when prices are high may equate
8 to the same volatility level as a smaller price movement when prices are at lower levels.

9 **TABLE-2**



10

11 **Q. HAVE YOU REVIEWED ANY STUDIES THAT HAVE EVALUATED**
12 **NATURAL GAS MARKET VOLATILITY?**

13 **A.** Yes. One study that stands out is “*An Analysis of Price Volatility in Natural Gas*
14 *Markets*” published by the EIA, Office of Oil and Gas in August 2007, which addresses
15 gas market volatility in the January 1994 through December 2006 period. The purpose

1 of the EIA volatility study was to "... address whether [or not] natural gas prices have
2 been more volatile in recent years ..."²⁷ The EIA analysis found no increasing or
3 decreasing trend in natural gas spot price volatility at the Henry Hub for the 1994
4 through 2006 period.²⁸

5
6 For the analysis in this case, I utilize the same approaches for measuring volatility
7 employed by EIA in their 1994 through 2006 volatility study. The goal of my review
8 is to determine if there is a discernable trend in natural gas spot price volatility. If in
9 fact a trend exists, that will be important information for the Commission to consider
10 in terms of how fuel price hedging should be addressed in the future.

11

12 **Q. HOW DID YOU MEASURE OR CALCULATE PRICE VOLATILITY FOR**
13 **YOUR ANALYSIS?**

14 **A.** To evaluate volatility trends, my analysis evaluated daily Henry Hub natural gas spot
15 prices between January 1997 and July 31, 2015. The Henry Hub spot price data is
16 available from the EIA at <http://www.eia.gov/dnav/ng/hist/rngwhhdm.htm>. The Henry
17 Hub is a primary trading location and, in my opinion, is representative of gas market
18 prices that Florida companies encounter in the market.

19

20 Historical price volatility is defined as the standard deviation of the relative change in
21 natural gas prices times a measure of trading days within the time period measured.²⁹

²⁷ "An Analysis of Price Volatility in Natural Gas Markets," Energy Information Administration, Office of Oil and Gas, (August 2007) at 2.

²⁸ *Id.*

²⁹ *Id.* at 3.

1 Viewed as a formula, natural gas price volatility is the standard deviation of price
2 change, where price change is measured as the day-to-day price change (p_t / p_{t-1}) ³⁰ A
3 natural log transformation of the day-to-day price change is where: $\Delta p_t = \ln(p_t / p_{t-1})$ ³¹
4 This log normal volatility measurement is similar to the statistical measure employed
5 by Morningstar in its historical measures of stock price volatility³² To annualize the
6 volatility result, the resulting standard deviation of the price change calculation was
7 multiplied times the square root of the ratio of 252 trading days by the number of
8 trading days for the period examined. For this analysis, annual and monthly periods
9 were examined.³³ The number of trading days employed for these analyses is 252 days
10 for the annual analysis.³⁴

11
12 One could measure volatility in terms of measuring the standard deviation of daily
13 percentage price changes $((p_t / p_{t-1}) - 1)$ or daily absolute price changes $(p_t - p_{t-1})$. The
14 relative historical relationships will remain the same so long as the volatility metric
15 employed is consistently applied.

16

17 **Q. DOES THE COMMODITY PRICE LEVEL DETERMINE VOLATILITY?**

18 **A.** No. Volatility is generally defined by the degree of price variation in the market.
19 Neither the absolute level of price nor the trend or direction of price determines

³⁰ Where p_t is today's price and p_{t-1} is the prior day price.

³¹ "An Analysis of Price Volatility in Natural Gas Markets," Energy Information Administration, Office of Oil and Gas, (August 2007) at 3-4.

³² Morningstar Investment Glossary, Historical Volatility at http://www.morningstar.com/InvGlossary/historical_volatility.aspx

³³ "An Analysis of Price Volatility in Natural Gas Markets," Energy Information Administration, Office of Oil and Gas, (August 2007) at 3-4.

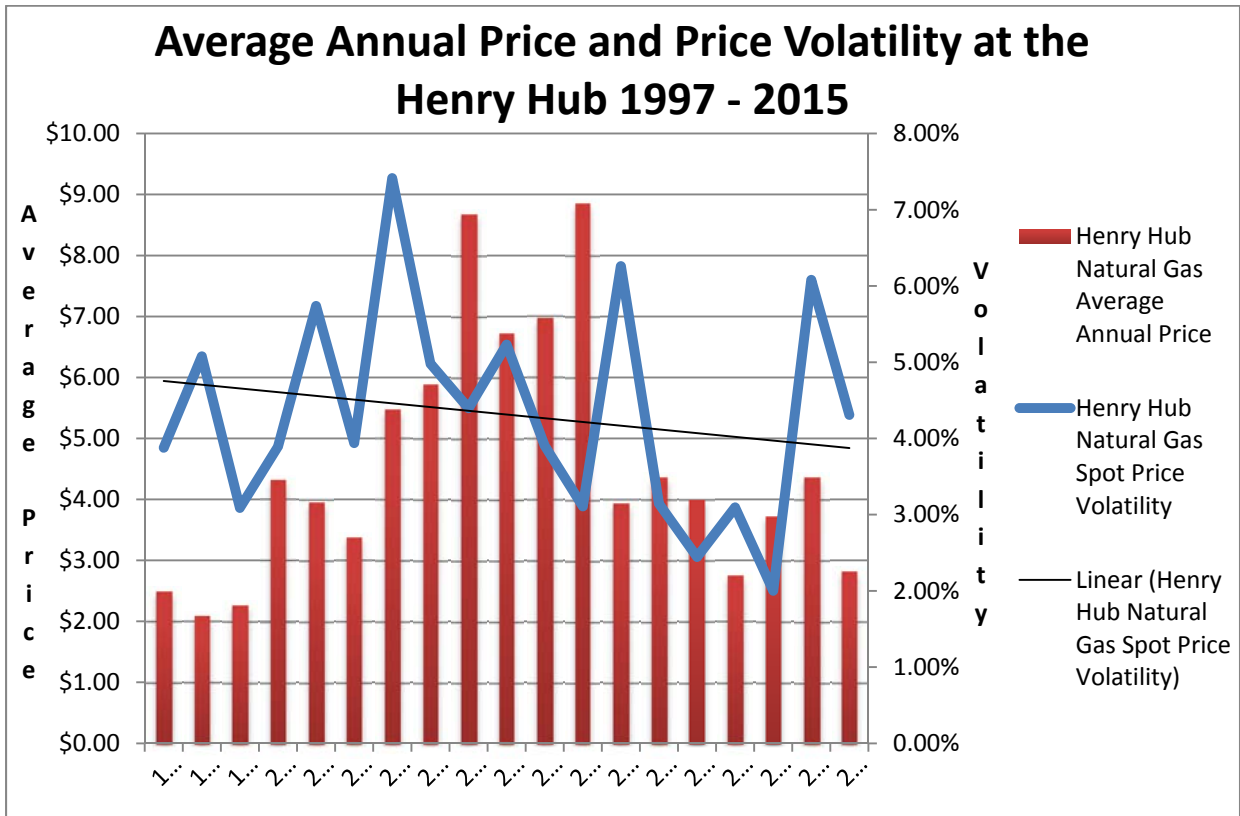
³⁴ *Id.* at 4.

1 volatility. Price volatility can be high or low when commodity prices are generally
2 high, and price volatility can be equally high or low when commodity prices are low.
3 Remember, volatility is a measure of change in the price of natural gas and not the
4 actual price itself.

5
6 **Q. PLEASE DESCRIBE YOUR ANNUAL PRICE VOLATILITY ANALYSIS AND**
7 **THE RESULTS OF YOUR PRICE VOLATILITY CALCULATIONS ON THE**
8 **NATURAL GAS MARKETS.**

9 **A.** I have included in Schedule (DJL-2) the results of my annual volatility analysis of
10 natural gas market price volatility for the period January 1997 through July 2015. The
11 analysis demonstrates that volatility measure has declined by about 24 percent from the
12 2000 to 2010 period to the more recent 2011 to July 2015 period. The volatility trend
13 is down, and average annual prices have declined 37.8 percent and are currently at some
14 of the lowest levels in the 2000 to 2015 historical period. I have included in Table 3 a
15 graphic depiction of average prices and price volatility measured on an annual basis
16 over the 2000 to July 2015 time horizon. Schedule (DJL-2) also includes separate
17 graphs of volatility and average price over the 2000 to 2015 period to capture the trends
18 in each market variable.

TABLE-3



2

3 The declining trend in volatility and decreased levels of volatility are clearly
 4 discernable in the 2010 to 2015 time period. While 2014 is an outlier to this declining
 5 volatility trend; much of the 2014 price volatility is due to a few days in February and
 6 March 2014 reflecting extreme weather expectations (related to the polar vortex
 7 impacting much of the country). If the short-term, extreme weather event is removed,
 8 the 2014 price volatility would be consistent with the levels estimated for 2011, 2012,
 9 2013, and 2015.

10

11 As discussed in the next Section of my testimony, the market changes from the supply
 12 side given expanded shale production and increased levels of reserves has led to
 13 decreased average annual prices and decreased levels of price volatility. Taking into

1 account the increases in supply and increases in natural gas storage, the potential for
2 short-term supply disruptions is reduced, which results in lower prices and less price
3 volatility. When I discuss the more recent EIA forecasts of the gas markets, I will
4 address this natural gas supply side impact on price and volatility.

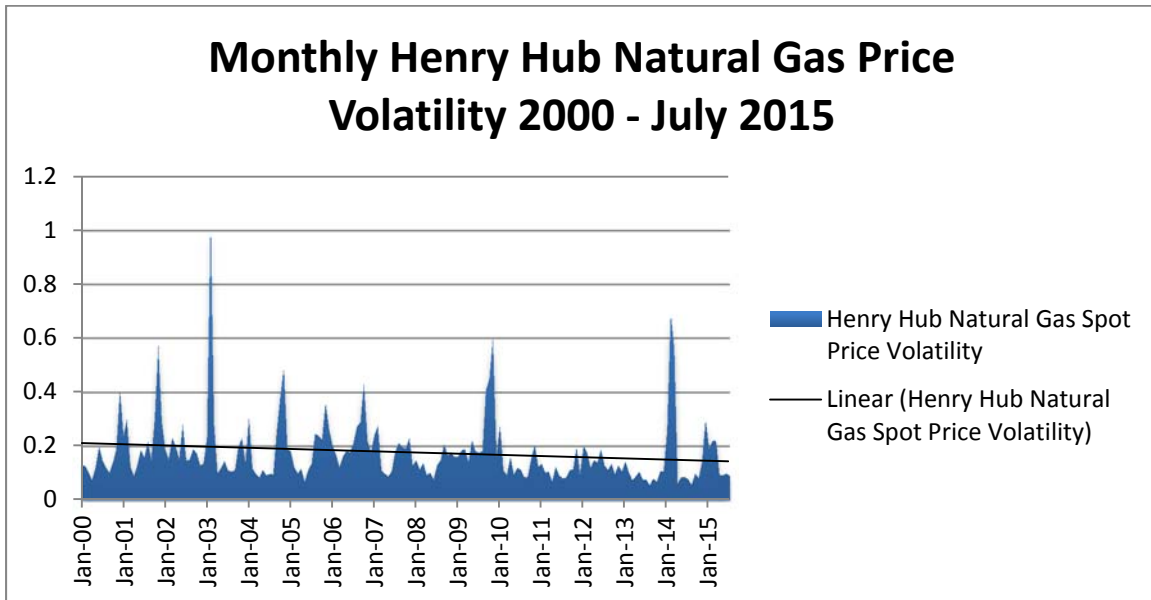
5

6 **Q. PLEASE DESCRIBE YOUR MONTHLY PRICE VOLATILITY ANALYSIS**
7 **AND THE RESULTS OF YOUR PRICE VOLATILITY CALCULATIONS ON**
8 **THE NATURAL GAS MARKETS.**

9 **A.** I have also included in Schedule (DJL-3) the results of the monthly volatility and
10 average price analyses for the period January 2000 through July 2015. All the
11 calculations employed the same data and formulas as the annual approach except that
12 monthly volatility estimates were annualized. Volatility, on a monthly basis, has
13 declined by over 28.0 percent from the 2000 – 2010 period to the more recent 2011 –
14 July 2015 as shown in Schedule (DJL-3). The volatility trend is down and average
15 monthly prices have declined 36.8 percent and are currently at some of the lowest levels
16 in the 2000 – 2015 historical period. I have included in Table 4 below a graphic
17 depiction of average prices and price volatility measured on a monthly basis over the
18 2000 to July 2015 time horizon.

1

TABLE-4



2

3 Similar to the results of the annual analysis, the monthly evaluation also shows price
4 volatility is declining. For the period 2011 – 2015, the amount of price dispersion is
5 much less than the earlier historical period. Again, the February 2014 period reflects
6 an outlier event explained by a few days of abnormal weather events impacting much
7 of the country simultaneously. Schedule (DJL-3) contains more detailed analyses of
8 the historical data that also shows the declining volatility and natural gas price trend.

9

10 In my opinion, these trends related to declining volatility and price are the result of
11 changes in the natural gas markets resulting from the increased gas supply, more
12 stable/less volatile gas prices, and lower gas prices, all of which are less subject to
13 intermittent supply disruptions.

1 **Q. PLEASE DESCRIBE YOUR MONTHLY PRICE VOLATILITY ANALYSES**
2 **CONTAINED IN SCHEDULES (DJL-4) THROUGH (DJL-8).**

3 **A.** These analyses are similar to the monthly analysis of natural gas price volatility
4 discussed in Schedule (DJL-3) above. The difference is that I broke down the 1997 to
5 2015 period into five periods to show added detail and changes over time in the
6 markets. Schedule (DJL-4) covers the 1997 to 1999 historical period, which is
7 generally a pre-hedging period. As demonstrated in Schedule (DJL-4), natural gas
8 prices remained relatively low throughout the period. Also, price volatility was
9 relatively low except for January 1997 and March through June of 1998.

10

11 Schedule (DJL-5) examines the period 2000 to 2002. This is the period where natural
12 gas hedging was implemented in many jurisdictions around the country and in Florida.
13 Price levels increased during 2000 with price spikes at the end of that year. Also, the
14 general level of volatility increased at the end of 2000 continuing into 2001.

15

16 Schedule (DJL-6) addresses the monthly volatility and average price levels in the 2003
17 to 2006 period. Average monthly price levels are substantially higher than prior
18 periods and trending up over the period. Natural gas price volatility levels and ranges
19 have increased during this period as well.

20

21 Schedule (DJL-7) reflects the monthly volatility and average price levels in the 2007
22 to 2010 period. This period covers increased natural gas shale development and, while
23 average price and volatility is generally the same as the 2003 to 2006 period shown in

1 Schedule (DJI-6), the later months in Schedule (DJI-7) show lower price levels and a
2 declining trend.

3 Schedule (DJI-8) covers the period 2011 through July 2015. In this period, average
4 price levels are substantially below price levels since 2003. Further, the general level
5 of volatility is well below all volatility levels experienced since 2000. The historical
6 market data clearly demonstrates lower and declining average price levels and lower
7 and declining price volatility levels.

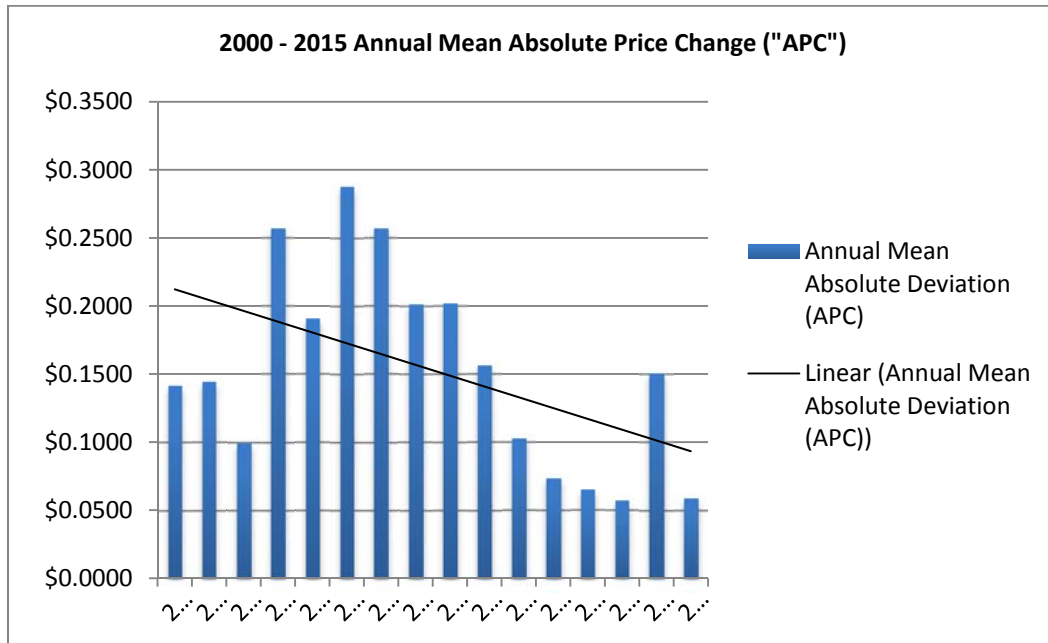
8

9 **Q. HAVE YOU PERFORMED ADDITIONAL ANALYSES OF GAS MARKET**
10 **PRICES ADDRESSING VOLATILITY?**

11 **A.** Yes. Below in Table 5 is an analysis of price variation considering the absolute value
12 of the price changes. This analysis of absolute price change deviation differs from the
13 previous analyses of percent changes in prices or volatility. The absolute price change
14 (“APC”) is determined by calculating the mean of the absolute day-to-day price
15 movements at the Henry Hub. The APC was calculated for all days for the period 2000
16 – July 2015. Each year the annual average was calculated on the absolute value of
17 price changes and the results are shown in Table 5 below:

1

TABLE-5



2

3

4

5

6

7

8

9

10

Q. HAVE YOU REVIEWED ADDITIONAL EVIDENCE DEMONSTRATING DECLINING VOLATILITY OF GAS MARKET PRICES?

11

12

A. Yes. The findings of the declining average price deviation discussed above is reinforced by calculating the number of days in each calendar year that the absolute deviation in price from the previous day exceeds 25 cents, 50 cents, and \$1 from 1997 through 2015.

13

14

1 Below in Table 6, I have included a tabulation of days where price deviations meet the
2 criteria above for the period 2000 through July 2015:

Table-6

Number of Trading Days with Absolute Price Deviations			
Meeting the Following Criteria			
YEAR	≥ 25 cents	≥ 50 cents	≥ \$1.00
2000	35	14	6
2001	47	17	1
2002	15	0	0
2003	51	19	6
2004	58	25	5
2005	90	40	13
2006	117	39	2
2007	69	15	1
2008	82	13	0
2009	46	9	1
2010	13	3	1
2011	2	0	0
2012	1	0	0
2013	1	0	0
2014	28	15	7
2015	4	0	0

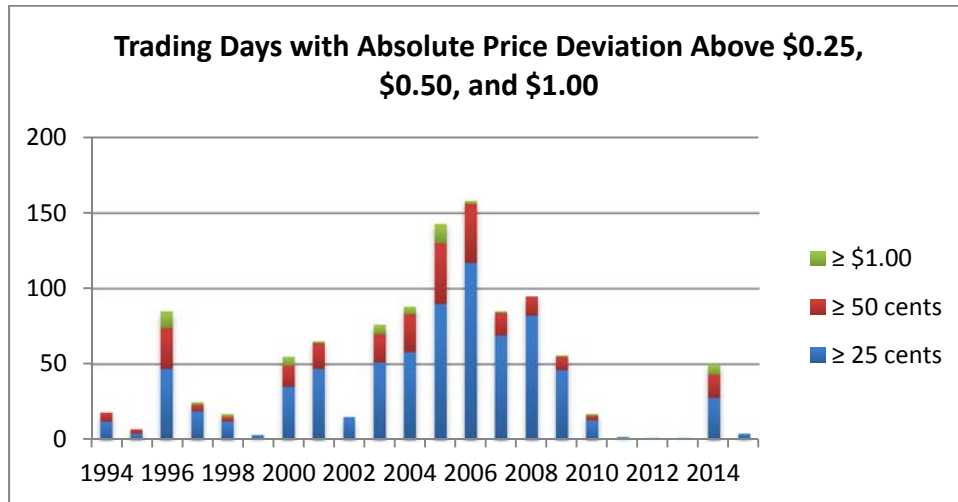
3 As shown in Table 6, since 2010 there are very few daily price movements that exceed
4 25 cents on a given day. Since 2011, there are no price movements that exceed 50 cents
5 or \$1.00 (except for the unusual events in 2014 discussed earlier). Given that the
6 purpose of hedging, in my opinion, is to avoid **extreme price changes and price**
7 **volatility**, Table 6 demonstrates extreme price changes are nonexistent since 2011
8 (except for the extraordinary events of 2014).

1

The raw data in Table 6 is summarized graphically in Table 7:

2

Table 7



3

4

As can be seen in Table 7 above, data in the years 2011, 2012, 2013, and 2015 barely register above zero, indicative of a substantial decline in large price movements.

5

6

7

Q. PLEASE SUMMARIZE YOUR EVALUATION OF HISTORICAL NATURAL GAS MARKET PRICES AND PRICE VOLATILITY.

8

9

A. The historical data demonstrates that natural gas market prices have generally declined to lower levels since 2011. More importantly, the historical data demonstrates that *price volatility* has substantially declined since 2011. The historical data demonstrates that the absolute level of price change has declined to lower levels relative to historic experiences. The size and frequency of average daily price changes has diminished to much lower levels demonstrating that price volatility has substantially declined.

10

11

12

13

14

1 **Q. DOES THE FACT THAT THE HISTORICAL AND CURRENT TRENDS IN**
2 **NATURAL GAS PRICES AND PRICE VOLATILITY ARE DECLINING**
3 **MEAN THAT FUTURE PRICES AND PRICE VOLATILITY WILL**
4 **CONTINUE TO DECLINE AND/OR REMAIN AT LOW LEVELS?**

5 **A.** No. The fact that price levels and price volatility have declined does not necessarily
6 mean that future price and volatility levels will remain low and/or continue to decline.
7 Given that gas price levels and price volatility are driven by the supply and demand
8 interaction in the market place, a review of the market and market expectations is
9 important to make an assessment of what the future holds. Historically, short-term
10 natural gas price levels and resulting volatility have been sensitive to short-run supply
11 and/or demand shifts and disruptions. Due to the natural gas consumers' inability to
12 fuel shift in the short run, supply and demand imbalances due to unexpected extreme
13 weather or other demand disruption, combined with limited ability to expand short-run
14 supply, have made gas markets significantly vulnerable to commodity price volatility.
15 I discuss in the next section how market changes have substantially expanded the
16 supply and availability of natural gas, leading to generally lower prices and decreased
17 levels of volatility relative to the past.

1 **SECTION VI: OVERVIEW OF CURRENT NATURAL GAS MARKETS**

2 **Q. HAVE ESTIMATES OF PROVED GAS RESERVES IN THE UNITED STATES**
3 **INCREASED?**

4 **A.** Yes. Proved reserves represent gas quantities that analyses show to be economically
5 recoverable. Proved reserves have increased every year since 1999³⁵ The total natural
6 gas proved reserves "... set a record of 354 trillion cubic feet ("Tcf") in 2013."³⁶ EIA's
7 analysis indicates that "[m]ajor advances in natural gas exploration and production
8 technologies has resulted in increased U.S. natural gas proved reserves."³⁷

9
10 In terms of reserves, there are additional large volumes of natural gas referred to as
11 "*undiscovered technically recoverable resources*."³⁸ Such resources are expected to
12 exist, as geological formations are favorable despite the uncertainty of the specific
13 locations. The EIA estimated that as of January 2012 the U.S. "had 1,932 Tcf of
14 undiscovered, technically recoverable resources of dry natural gas."³⁹ That is about 65
15 years' worth of gas, assuming a consumption level of 30 Tcf per year. Obviously, the
16 actual number of years of gas supply will depend on annual gas consumption, gas
17 imports and/or exports, and net additions to gas supply reserves each year.

³⁵ "Natural Gas Explained", U.S. Energy Information Administration (February 2, 2015) at 1. URL: www.eia.gov/Energyexplained/index.cfm?page=natural_gas_reserves

³⁶ *Id.*

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

1 **Q. HAVE YOU REVIEWED THE FORECAST OF FUTURE NATURAL GAS**
2 **MARKET PRICES AND SUPPLIES?**

3 **A.** Yes. My first review examined the EIA Annual Energy Outlook 2011. This was the
4 most current long-term forecast available to this Commission when the October 2011
5 Workshop reviewed hedging for Florida utilities. The EIA Annual Energy Outlook
6 2011 forecast estimated long-term growth (through 2035) in prices of 4.1%, production
7 growth of 0.9%, reserves of 314 Tcf, and consumption levels growing through 2035 at
8 0.6%.⁴⁰

9 The 2011 EIA forecast states the following regarding natural gas prospects in general
10 and shale gas specifically:

11 Unlike crude oil prices, natural gas prices do not return to the higher
12 levels recorded before the 2007-2009 recession. ... The large difference
13 between crude oil and natural gas prices results in a shift in drilling
14 towards shale formations with high concentrations of liquids.

15 **Shale gas continues to have enormous potential....**⁴¹ (emphasis
16 added)

17 Now, a short four years later, the 2015 EIA forecast estimates long-term natural gas
18 growth in prices of 4.4% (through 2035), production growth of 1.5% (through 2035),
19 consumption levels growing through 2035 at 0.4%⁴² and gas reserve levels of 345 Tcf.⁴³

20 The following Table 8 summarizes the comparison of the 2011 and 2015 EIA forecasts

⁴⁰ Annual Energy Outlook 2011, Energy Information Administration Table A1 p.115 and Table A13 & A14 pp. 142-143.

⁴¹ *Id.* at 78-79.

⁴² Annual Energy Outlook 2015, Energy Information Administration, Appendix A, Table A-1, The compound annual growth rate (CAGR) in nominal price of 4.4%, production 1.5%, and consumption 0.4% calculated between 2013 and 2035 from Appendix A, Table A-1.

⁴³ *Id.* Appendix A, Table A-14.

1 of natural gas prices, production, and reserves through 2030.

2 **Table 8⁴⁴**

3 **COMPARISON OF 2011 TO 2015 EIA NATURAL GAS ESTIMATES**

	2011 EIA Forecast	2011 EIA Forecast	2015 EIA Forecast	2015 EIA Forecast
YEAR	FORECAST PRICE	PRODUCTION (Tcf)	FORECAST PRICE	PRODUCTION (Tcf)
2015	\$5.09	23.01	\$2.80 current price	24.40
2020	\$6.10	24.04	\$5.54	28.82
2025	\$7.90	24.60	\$6.72	30.51
2030	\$9.28	25.75	\$7.63	33.01

4

5 As demonstrated in the above chart, the EIA's current 2015 natural gas forecast
6 estimates show increased production and lower prices in every year when compared to
7 the 2011 EIA estimates. Generally, the stability and strength in the natural gas markets
8 continue with the dramatic increases in production at lower price levels. Further, the
9 declining prices estimates for natural gas are consistent with the historical record,
10 showing declining prices, as discussed in Section III above. The natural gas market
11 strength and maturity are also demonstrated by the continued increases in production
12 in light of lower price forecast estimates.

⁴⁴ Annual Energy Outlook 2011, Energy Information Administration Table A1 p. 115-116, Annual Energy Outlook 2015, Energy Information Administration Tables A-14 and Table B-1. Note: Price value of \$6.72 interpolated from 2020 and 2030 estimates.

1 **Q. DO CURRENT FORECASTS OF NATURAL GAS MARKET PRICE, SUPPLY**
2 **LEVELS, AND RESERVES SUGGEST THAT CONTINUATION OF**
3 **FINANCIAL HEDGING WILL CONTINUE TO BE COSTLY TO FLORIDA**
4 **CONSUMERS RELATIVE TO ANY POTENTIAL BENEFITS OF PRICE**
5 **VOLATILITY REDUCTIONS?**

6 A. Yes. As discussed above, current forecasts of natural gas markets indicate low and
7 stable prices in the near term. These same forecasts also show plentiful supply and
8 availability of natural gas and stable economic conditions. These forecasts indicate
9 substantial changes (e.g., increased shale development) in natural gas markets have
10 taken place since 2008 and 2011. Moreover, these current natural gas market forecasts
11 demonstrate that the prior justifications and reasons for past natural gas hedging efforts
12 (e.g., price volatility mitigation, threats to market supply, other factors influencing
13 demand) are no longer available as reasons supporting the need to continue natural gas
14 financial hedging activities. Given these current factors, it is more important than ever
15 to consider the enormous opportunity costs incurred by consumers resulting from
16 locking in fuel costs through hedging plans.

17
18 **Q. IS THERE ADDITIONAL EVIDENCE THAT THE MARKET CHANGES YOU**
19 **DISCUSSED HAVE HAD AN IMPACT ON NATURAL GAS PRICE**
20 **VOLATILITY AND PRICE LEVELS?**

21 A. Yes. A June 2013 Wall Street Journal article and analysis “*Volatility Evaporates in*
22 *Natural-Gas Market*” describes and analyzes how price volatility has collapsed in the
23 natural gas market. The article and analysis conclude that, “[b]ooming U.S. gas

1 production has led to fewer supply disruptions, smoothing out the big ups and downs
2 that once dominated the market for natural gas.”⁴⁵ The Wall Street Journal analysis
3 also noted that day-to-day price moves have declined each year since 2005.⁴⁶ As
4 discussed earlier, the historical analyses demonstrate how the statistical metrics for
5 natural gas price volatility is declining significantly each and every year. A review of
6 the historical data discussed in Section III demonstrates this declining price variability
7 to be a fact.

8

9 **SECTION VII: REGULATORY REVIEW OF FINANCIAL HEDGING**

10 **Q. HAS THIS COMMISSION REVIEWED THE FLORIDA COMPANIES’**
11 **HEDGING PROGRAMS?**

12 **A.** Yes, this Commission reviews the Florida Companies’ hedging proposals and Risk
13 Management Plans each year in the fuel docket.

14

15 The Commission specifically reviewed the natural gas financial hedging issues in an
16 October 2011 Workshop Session (“Workshop”).⁴⁷ As I understand, the purpose of the
17 Workshop was to:

18 ... look at ... with the additional shale gas production ... any other
19 changes that are out there, do we need to relook at how we’re doing or
20 what we’re doing at this point ...⁴⁸

21

⁴⁵ “Volatility Evaporates in Natural-Gas Market,” <http://blogs.wsj.com/moneybeat/2013/06/06/volatility-evaporates-in-natural-gas-market/>

⁴⁶ *Id.*

⁴⁷ New Issues In Hedging, Florida Public Service Commission, Undocketed Workshop, (October 4, 2011)

⁴⁸ *Id.* at 5:13-17 quoting Commissioner Balbis.

1 The Commission Staff further summarized the purpose of the Workshop:

2 ... this workshop is to discuss new information that may affect the
3 hedging activities by the investor-owned utility companies. Today's
4 topic for discussion include issues that affect natural gas price hedging
5 since the issuance of Commission Order PSC-08-0667-PAA-EI on
6 October 8, 2008. These topics include but are not limited to areas such
7 as development of shale gas, natural gas price volatility, current state of
8 the economy ...⁴⁹
9

10 Based on a review of the Workshop transcript, Mr. McCallister of Progress Energy
11 (N/K/A DEF) proceeded to provide a joint investor-owned utility ("IOU") presentation
12 addressing the Workshop topics.⁵⁰ Mr. McCallister's IOU presentation basically
13 concluded that: "... developments in the natural gas markets do not warrant changes to
14 the Commission's hedging policies and procedures that were established in 2008."⁵¹
15

16 The Companies' joint presentation addressed and emphasized growth in shale gas
17 production.⁵² The joint presentations also emphasized while "...natural gas prices and
18 volatility have declined, it is impossible to predict to what magnitude circumstances
19 may change and an increase in price and volatility."⁵³ Presented as examples of factors
20 that could impact natural gas market output, prices, and price volatility were
21 "[i]ncreased regulation of shale gas production,"⁵⁴ and the potential of LNG exports
22 pressuring gas prices upwards.⁵⁵
23

⁴⁹ *Id.* at 6: 2-10 quoting Mr. Franklin Commission Staff.

⁵⁰ *Id.* at 6:10-12.

⁵¹ *Id.* at 7:10-12.

⁵² *Id.*

⁵³ *Id.* at 22: 14-17.

⁵⁴ *Id.* at 22: 17-18.

⁵⁵ *Id.* at 22: 19-21.

1 The IOU joint presentation basically concluded that:

2 ... developments in the natural gas market do not warrant changes to the
3 Commission's hedging policies and procedures that were established in
4 2008. And as we stand today, the IOUs continue to implement their
5 hedging programs consistent with those policies and procedures.⁵⁶
6

7 Since the 2011 Commission Hedging Workshop, the IOU hedging programs were left
8 intact, and were implemented by the IOUs, which brings us to the main issue in today's
9 fuel docket proceeding – Is it in the consumers' best interest for the utilities to continue
10 to financially hedge natural gas?

11 **Q. HAVE THE FLORIDA IOUs INCURRED SUBSTANTIAL ADDITIONAL**
12 **ABOVE MARKET NATURAL GAS COSTS SINCE THE OCTOBER 2011**
13 **WORKSHOP?**

14 **A.** Yes. As shown in Section III above, since the October 2011 Workshop, the IOU's
15 financial hedging efforts have collectively cost customers approximately \$2.5 billion
16 in increased gas fuel costs. Moreover, the historical facts demonstrate that natural gas
17 price market volatility is declining from historical levels. Thus, since the October 2011
18 Commission Workshop, the cost/benefit evaluation of the natural gas financial hedging
19 programs indicates a substantial cost to consumers with questionable benefits.
20

21 **Q. HAVE OTHER REGULATORY COMMISSIONS ADDRESSED THE**
22 **FINANCIAL HEDGING ISSUE?**

23 **A.** Yes, the Kentucky and Nevada utility commissions have addressed hedging.

⁵⁶ *Id.* at 22:23 through 23:2.

1 **Q. WOULD YOU DESCRIBE THE SITUATION IN KENTUCKY?**

2 **A.** Yes. In recent gas cases in the state of Kentucky, the Kentucky Public Service
3 Commission ordered that the then existing financial hedging programs should not be
4 extended.⁵⁷ In the case of Columbia Gas of Kentucky, Inc., a gas utility proceeding,
5 the Kentucky Commission concluded the following regarding financial hedging natural
6 gas prices:

7 ... the Commission finds that Columbia’s hedging program should not
8 be extended. **The Commission finds that current conditions and the**
9 **outlook for future natural gas supplies and price are sufficiently**
10 **different in 2014 from what they were in 2001 to allay our concern**
11 **regarding the potential adverse impact of price volatility and**
12 **extreme winter spikes on customer bills. We therefore conclude**
13 **that it is no longer reasonable to impose the cost attendant to**
14 **hedging, to the extent there is net cost rather than net savings, to be**
15 **passed along to Columbia’s customers as part of their gas cost....**

16 ...
17

18 While there is no guarantee that comparable [higher] prices and
19 volatility will not recur, current projections from the United States
20 Energy Information Administration’s (“EIA”) 2014 Annual Energy
21 Outlook indicate prices not to exceed \$8.00 per Mcf through 2040 using
22 the reference case ... More importantly with regard to volatility, the
23 trend in price increases is projected to be gradual and steady in the long
24 run.⁵⁸ (emphasis added)
25

26
27 The Kentucky Commission then issued an order that Columbia Gas “...cease hedging
28 activities as of the date of this Order.”⁵⁹

29

⁵⁷ See for example *Application of Columbia Gas of Kentucky, Inc. to Extend its Gas Price Hedging Plan*, Case No. 2013-00354 Final Order at 4 (September 17, 2014), also see *Application of Atmos Energy Corporation For Continuation Of Its Hedging Program*, Case No. 2013-00421, Final Order at 4, (September 18, 2014), also see *Application Duke Energy Kentucky, Inc. To Implement A Hedging program to Mitigate Price Volatility In the Procurement Of Natural Gas*, Case No. 2015-00025, Final order at 4, (May 27, 2015).

⁵⁸ *Application of Columbia Gas of Kentucky, Inc. to Extend its Gas Price Hedging Plan*, Case No. 2013-00354 Final Order at 4 (September 17, 2014).

⁵⁹ *Id.* at 7.

1 Contemporaneous with the Columbia Gas hedging issues, the Kentucky Commission
2 addressed the same issue involving another Kentucky gas utility, Atmos Energy
3 Corporation (“Atmos”).⁶⁰ In the Atmos case, the Kentucky Commission stated:

4 Based on the evidence of record ... the Commission finds that Atmos’
5 hedging program should not be extended. ... **The Commission finds**
6 **that current conditions and the outlook for future natural gas**
7 **supplies and prices are sufficiently different in 2014 from what they**
8 **were in 2001 to allay our concern regarding the potential adverse**
9 **impact of price volatility on customer bills. We therefore conclude**
10 **that it is no longer reasonable to impose the cost attendant to**
11 **hedging**⁶¹ (emphasis added)
12

13 On or about March 27, 2015, the Kentucky Commission addressed the Duke Energy
14 Kentucky, Inc.’s (“DEK’s”) January 28, 2015 request to continue its gas hedging
15 program for its gas utility for an additional three years through March 2018.⁶² DEK is
16 a combined electric and gas utility. In that proceeding, the Kentucky Commission
17 noted that DEK “... declared its willingness to discontinue seeking to extend its
18 [hedging] program if the Commission did not want the program to be continued.”⁶³ The
19 Kentucky Commission went on to state:

20 The Commission’s concern with regard to the extension of gas cost
21 hedging programs,**continued low and stable gas prices could**
22 **obviate the need for hedging.** This was the conclusion we reached in
23 those cases and is the conclusion we now reach in this case. ...The
24 **Commission finds that current conditions and the outlook for**
25 **future natural gas supplies and prices are sufficiently different in**
26 **2015 from what they were in 2001 to allay our concern regarding**
27 **the potential adverse impact of price volatility on customer bills.**⁶⁴
28 (emphasis added)
29

⁶⁰ *Application of Atmos Energy Corporation For Continuation Of Its Hedging Program*, Case No. 2013-00421, Final Order at 4, (September 18, 2014).

⁶¹ *Id.* at 4-5.

⁶² *Application Duke Energy Kentucky, Inc. To Implement A Hedging program to Mitigate Price Volatility In the Procurement Of Natural Gas*, Case No. 2015-00025, Final order at 1, (May 27, 2015).

⁶³ *Id.* at 3.

⁶⁴ *Id.* at 4.

1 The financial hedging programs for gas utility companies are no longer part of the fuel
2 procurement process in Kentucky. Moreover, the current EIA forecasts demonstrate
3 that gas market fuel supply is plentiful and gas price volatility is not the issue it once
4 was.

5 **Q. HAVE OTHER REGULATORY AUTHORITIES ENTERED RECENT**
6 **ORDERS APPROVING THE CESSATION OF GAS HEDGING ACTIVITES?**

7 **A.** Yes. On or about November 5, 2013, the Public Utilities Commission of Nevada
8 (“Nevada Commission”) approved a Stipulation of the parties that ceased the operation
9 of the Southwest Gas hedging program.⁶⁵

10

11 This approval of the Stipulation in the Southwest Gas case follows Nevada
12 Commission Orders approving ending natural gas financial hedging for the two major
13 electric utilities in Nevada.⁶⁶ There has been no financial gas hedging for these Nevada
14 utility companies associated with natural gas procurement since the Nevada
15 Commission issued the above referenced orders.

⁶⁵ Application of Southwest Gas Corporation to establish Base Tariff General rates, Unrecovered Gas Cost Expense rates, distribution shrinkage rates, commodity and reservation rates, and Renewable Energy Program rates, Before the Public Utilities Commission of Nevada, Docket No. 13-06006, Order approving Stipulation and Agreement at 3, 4, 13-14 (December 3, 2013).

⁶⁶ See Application of Sierra Pacific power Company d/b/a NV Energy for approval of its 2011-2013 Triennial Integrated Resource Plan, Docket No. 10-07003 (October 20, 2010), Compliance Order approving Amended and Re-stated Phase II (Energy Supply Plan) Stipulation at 4, 10-11, paragraph 10((a)-(g)). Also see Application of Nevada Power Company d/b/a NV Energy for approval of its Energy Supply Plan Update for 2011-2012, Docket No. 10-09003, Order approving Stipulation at 2 (December 16, 2010); See Stipulation at 2-3, paragraph 1 (a)-(f).

1 **Q. ARE YOU AWARE OF OTHER REGULATORY AUTHORITIES THAT DO**
2 **NOT ALLOW FINANCIAL HEDGING IN THE NATURAL GAS**
3 **PROCUREMENT PROCESS?**

4 **A.** Yes. The Public Utility Commission of Texas historically has not authorized the
5 regulated fully integrated electric utilities in areas outside of the Electric Reliability
6 Council of Texas to employ financial hedging in the fuel procurement activities of the
7 utility. The Railroad Commission of Texas, the regulatory authority charged with
8 regulating gas utility companies in Texas has not pre-approved a gas utility company
9 including expenses of financial hedges (including the increased expense of an out of
10 money hedge) from gas or fuel adjustment clauses.⁶⁷ CenterPoint Energy Texas has
11 elected to not employ financial hedging as a fuel procurement strategy.

12 It is true that most regulatory authorities authorize utility companies to employ some
13 form of financial hedging in fuel procurement. However, those regulatory authorities
14 which have recently taken up and ruled on this financial hedging question (like
15 Kentucky and Nevada) have concluded that, given current gas market conditions and
16 forecasts, there is no need for financial hedging in the gas procurement process.

17
18 **Q. HAVE ADDITIONAL UTILITIES CONSIDERED THE NATURAL GAS**
19 **MARKET CHANGES AND SUSPENDED HEDGING ACTIVITIES?**

20 **A.** Yes. Colorado Springs Utilities is an example of a utility that in 2009 considered

⁶⁷ Statement of Intent of CenterPoint Energy Resources Corp. D/B/A CenterPoint Energy Entex and CenterPoint Energy Texas Gas To Increase rates On A Division-Wide Basis In The Houston Division, Railroad Commission of Texas, Gas Utilities docket No. 9902 (Consolidated), Final Order at 12, FoF 103, (February 23, 2010).

1 declining gas market costs and reviewed the merits of its hedging program, and in 2010
2 reduced the volumes and lengths of its hedges. Subsequently, after added market
3 review and the recognition of gas market stability, Colorado Springs Utilities
4 suspended all hedging in 2011, allowing its hedged supply contracts to expire in 2013.⁶⁸

5
6 **Q. IN YOUR OPINION, HAS THE NATURAL GAS MARKET SUBSTANTIALLY**
7 **CHANGED SINCE THE FLORIDA COMMISSION’S 2011 FUEL HEDGING**
8 **WORKSHOP?**

9 **A.** Yes. As outlined in the Kentucky Commission Orders discussed earlier and shown in
10 the analysis presented in my testimony, the natural gas markets have changed
11 substantially over the past few years. The recent and current EIA forecasts show that
12 natural gas production has substantially increased, probable and recoverable gas
13 reserves for the future have increased substantially, forward estimates of natural gas
14 prices have declined and become more stable, and price volatility has declined. Based
15 on these factors, some regulatory authorities and utilities have concluded financial
16 hedging is no longer necessary and moreover is no longer worth the risks or costs
17 associated with financial hedging.

⁶⁸ Colorado Springs Utilities web page “Natural gas hedging program,” www.csu.org/Pages/nghedging.aspx

1 **SECTION VIII: AN ALTERNATIVE APPROACH TO PRICE VOLATILITY**

2 **Q. WHAT ISSUE(S) ARE YOU ADDRESSING IN THIS SECTION OF YOUR**
3 **TESTIMONY?**

4 **A.** The issues addressed in this Section of my testimony consider – in light of recent
5 historical events in the natural gas markets with low natural gas price volatility, stable
6 markets with limited disruptions, increased supply and growing natural gas reserves,
7 and stable gas prices – what alternatives to financial gas hedging are available to
8 address gas price volatility?

9
10 **Q. HAVE ANY OF THE FLORIDA COMPANIES PREVIOUSLY PROPOSED**
11 **ALTERNATIVES TO FINANCIAL HEDGING THAT WOULD ADDRESS**
12 **FUEL PRICE VOLATILITY IMPACTS ON CONSUMERS?**

13 **A.** Yes. In 2008, FPL proposed a volatility mitigation mechanism (“VMM”) as an
14 alternative to FPL’s financial and physical fuel price hedging programs.⁶⁹ FPL later
15 withdrew its request for a VMM and proposed hedging guidelines to govern the
16 regulatory risk associated with its prior hedging program.⁷⁰ In its VMM proposal, FPL
17 noted concerns related to asymmetric risks and rewards under FPL’s hedging
18 program.⁷¹ FPL stated “... hedging the prices FPL pays for fuel, that is not necessarily
19 the only or best approach.”⁷² FPL went on to state:

20 FPL has concluded that the volatility in customer fuel charges can be
21 mitigated almost as effectively as it has under FPL’s current hedging

⁶⁹ Notice of Proposed Agency Action Order Clarifying Hedging Order And Providing Guidelines, Docket No. 080001-EI (October 2008) at 2.

⁷⁰ *Id.* at 3.

⁷¹ Petition of Florida Power & Light for Approval of Improved Volatility Mitigation Mechanism, Docket No. 080001-EI (January 31, 2008) at 4.

⁷² *Id.* at 7.

1 program, by collecting under-recoveries of unhedged fuel costs over
2 two years instead of one year ... other aspects of the fuel clause would
3 continue to work as they do currently.⁷³

4
5 In terms of benefits of the VMM versus hedging, FPL noted the following: (i) FPL
6 customers would avoid transaction costs associated with hedging, (ii) FPL customers
7 would no longer pay risk premiums for fuel costs, (iii) deferred two-year fuel under-
8 recoveries are financed at the low cost commercial paper interest rate; (iv) over-
9 recoveries would flow back to FPL customers over one-year per the fuel rule; and
10 (v) more opportunities for FPL customers to benefit promptly and completely from
11 short-term price declines.⁷⁴

12
13 Given the substantial changes in the natural gas markets regarding price, production,
14 supply, and overall market stability, and given current forecasts of stable natural gas
15 markets, and given the enormous customer higher-than-market fuel opportunity costs
16 experienced since 2011, an alternative such as the FPL proposed VMM in 2008 is better
17 than the *status quo* automatic hedging required by the Companies' Risk Management
18 Plans.

19
20 Each year, the Commission reviews fuel costs and determines the appropriate amount
21 of over/(under) fuel recovery. However, to the extent the Commission determines a
22 large or material under-recovery of fuel costs has occurred, the Commission *in its*
23 *regulatory discretion* can determine, without formally adopting FPL's 2008 VMM

⁷³ *Id.* at 7.

⁷⁴ *Id.* at 8-9.

1 proposal, whether a large under-recovery should be recovered over a one-year or longer
2 period. Such an efficient, rational approach curbs the impact of price volatility on
3 customers without the negative impacts of financial hedging.

4

5 **Q. ARE YOU RECOMMENDING THAT THE COMMISSION ADOPT FPL'S**
6 **2008 VMM PROPOSAL OR A SIMILAR MECHANISIM?**

7 **A.** No. I am recommending that the Commission deny approval of the Companies' 2016
8 Risk Management Plans, and order the Companies to discontinue financial hedging of
9 natural gas.

10

11 **SECTION IX: CONCLUSIONS AND RECOMMENDATIONS**

12 **Q. PLEASE SUMMARIZE YOUR CONCLUSIONS AND RECOMMENDATIONS**
13 **REGARDING NATURAL GAS FINANCIAL HEDGING.**

14 **A.** Since this Commission's first order on hedging in 2002, natural gas markets have
15 changed substantially. Natural gas prices, production, and supply are not as volatile as
16 was experienced in the early 2000 time frame. Current gas market forecasts do not
17 estimate volatile markets, but instead predict increased production at lower prices than
18 earlier forecasts. Historical evidence since 2000 shows volatility in the gas markets to
19 be declining. The historical cost of hedging in terms of paying higher-than-market
20 prices for fuel has been staggering to Florida consumers for the past 12 years. A fair
21 balancing of the declining volatility and declining hedging benefits to consumers
22 against the substantial costs of hedging suggest that the cost/benefit assessment does
23 not support future hedging. For all of the above reasons, I recommend that the
24 Companies' proposed financial hedging plans not be approved and that financial

1 hedging of natural gas should be discontinued on a going-forward basis. If
2 circumstances change substantially, hedging can be visited again in the future.

3

4 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

5 **A.** Yes, it does.

DANIEL J. LAWTON
B.A. ECONOMICS, MERRIMACK COLLEGE
M.A. ECONOMICS, TUFTS UNIVERSITY

Prior to beginning his own consulting practice Diversified Utility Consultants, Inc., in 1986 where he practiced as a firm principal through December 31, 2005, Mr. Lawton had been in the utility consulting business with a national engineering and consulting firm. In addition, Mr. Lawton has been employed as a senior analyst and statistical analyst with the Department of Public Service in Minnesota. Prior to Mr. Lawton's involvement in utility regulation and consulting he taught economics, econometrics, statistics and computer science at Doane College.

Mr. Lawton has conducted numerous revenue requirements, fuel reconciliation reviews, financial, and cost of capital studies on electric, gas and telephone utilities for various interveners before local, state and federal regulatory bodies. In addition, Mr. Lawton has provided studies, analyses, and expert testimony on statistics, econometrics, accounting, forecasting, and cost of service issues. Other projects in which Mr. Lawton has been involved include rate design and analyses, prudence analyses, fuel cost reviews and regulatory policy issues for electric, gas and telephone utilities. Mr. Lawton has developed software systems, databases and management systems for cost of service analyses.

Mr. Lawton has developed and numerous forecasts of energy and demand used for utility generation expansion studies as well as municipal financing. Mr. Lawton has represented numerous municipalities as a negotiator in utility related matters. Such negotiations ranges from the settlement of electric rate cases to the negotiation of provisions in purchase power contracts.

In addition to rate consulting work Mr. Lawton through the Lawton Law Firm represents numerous municipalities in Texas before regulatory authorities in electric and gas proceedings. Mr. Lawton also represents municipalities in various contract and franchise matters involving gas and electric utility matters.

A list of cases in which Mr. Lawton has provided testimony is attached.

UTILITY RATE PROCEEDINGS IN WHICH TESTIMONY HAS BEEN PRESENTED BY DANIEL J. LAWTON

JURISDICTION/COMPANY	DOCKET NO.	TESTIMONY TOPIC
ALASKA REGULATORY COMMISSION		
Beluga Pipe Line Company Municipal Light & Power Enstar Natural Gas Co.	P-04-81 U-13-184 U-14-111	Cost of Capital Cost of Capital Cost of Capital

PUBLIC UTILITIES COMMISSION OF CALIFORNIA		
Southern California Edison	12-0415	Cost of Capital
San Diego Gas and Electric	12-0416	Cost of Capital
Southern California Gas	12-0417	Cost of Capital
Pacific Gas and Electric	12-0418	Cost of Capital

GEORGIA PUBLIC SERVICE COMMISSION		
Georgia Power Co.	25060-U	Cost of Capital

FEDERAL ENERGY REGULATORY COMMISSION		
Alabama Power Company	ER83-369-000	Cost of Capital
Arizona Public Service Company	ER84-450-000	Cost of Capital
Florida Power & Light	EL83-24-000	Cost Allocation, Rate Design
Florida Power & Light	ER84-379-000	Cost of Capital, Rate Design, Cost of Service
Southern California Edison	ER82-427-000	Forecasting

LOUISIANA PUBLIC SERVICE COMMISSION		
Louisiana Power & Light	U-15684	Cost of Capital, Depreciation
Louisiana Power & Light	U-16518	Interim Rate Relief
Louisiana Power & Light	U-16945	Nuclear Prudence, Cost of Service

MARYLAND PUBLIC SERVICE COMMISSION		
Baltimore Gas and Electric Company	9173	Financial
Baltimore Gas and Electric Company	9326	Financial

MINNESOTA PUBLIC UTILITIES COMMISSION		
Continental Telephone	P407/GR-81-700	Cost of Capital
Interstate Power Co.	E001/GR-81-345	Financial
Montana Dakota Utilities	G009/GR-81-448	Financial, Cost of Capital
New ULM Telephone Company	P419/GR81767	Financial
Norman County Telephone	P420/GR-81-230	Rate Design, Cost of Capital
Northern States Power	G002/GR80556	Statistical Forecasting, Cost of Capital
Northwestern Bell	P421/GR80911	Rate Design, Forecasting

MISSOURI PUBLIC SERVICE COMMISSION		
Missouri Gas Energy	GR-2009-0355	Financial
Ameren UE	ER-2010-0036	Financial

FLORIDA PUBLIC SERVICE COMMISSION		
Progress Energy	070052-EI	Cost Recovery
Florida Power and Light	080677-EI	Financial
Florida Power and Light	090130-EI	Depreciation
Progress Energy	090079-EI	Depreciation
Florida Power and Light	120015-EI	Financial Metrics
Florida Power and Light	140001-EI	Economic and Regulatory Policy Issues

NORTH CAROLINA UTILITIES COMMISSION		
North Carolina Natural Gas	G-21, Sub 235	Forecasting, Cost of Capital, Cost of Service

OKLAHOMA PUBLIC SERVICE COMMISSION		
Arkansas Oklahoma Gas Corporation	200300088	Cost of Capital
Public Service Company of Oklahoma	200600285	Cost of Capital
Public Service Company of Oklahoma	200800144	Cost of Capital
Public Service Company of Oklahoma	201200054	Financial and Earnings Related

PUBLIC SERVICE COMMISSION OF INDIANA		
Kokomo Gas & Fuel Company	38096	Cost of Capital

PUBLIC UTILITY COMMISSION OF NEVADA		
Nevada Bell	99-9017	Cost of Capital
Nevada Power Company	99-4005	Cost of Capital
Sierra Pacific Power Company	99-4002	Cost of Capital
Nevada Power Company	08-12002	Cost of Capital
Southwest Gas Corporation	09-04003	Cost of Capital
Sierra Pacific Power Company	10-06001 & 10-06002	Cost of Capital & Financial
Nevada Power Co. and Sierra Pacific Power Co.	11-06006 11-06007 11-06008	Cost of Capital
Southwest Gas Corp.	12-04005	Cost of Capital
Sierra Power Company	13-06002 13-06003 13-06003	Cost of Capital
NV Energy & MidAmerican Energy Holdings Co.	13-07021	Merger and Public Interest Financial

PUBLIC SERVICE COMMISSION OF UTAH		
PacifiCorp	04-035-42	Cost of Capital
Rocky Mountain Power	08-035-38	Cost of Capital
Rocky Mountain Power	09-035-23	Cost of Capital
Rocky Mountain Power	10-035-124	Cost of Capital
Rocky Mountain Power	11-035-200	Cost of Capital

Questar Gas Company	13-057-05	Cost of Capital
Rocky Mountain Power	13-035-184	Cost of Capital

SOUTH CAROLINA PUBLIC SERVICE COMMISSION		
Piedmont Municipal Power	82-352-E	Forecasting

PUBLIC UTILITY COMMISSION OF TEXAS		
Central Power & Light Company	6375	Cost of Capital, Financial Integrity
Central Power & Light Company	9561	Cost of Capital, Revenue Requirements
Central Power & Light Company	7560	Deferred Accounting
Central Power & Light Company	8646	Rate Design, Excess Capacity
Central Power & Light Company	12820	STP Adj. Cost of Capital, Post Test-year adjustments, Rate Case Expenses
Central Power & Light Company	14965	Salary & Wage Exp., Self-Ins. Reserve, Plant Held for Future use, Post Test Year Adjustments, Demand Side Management, Rate Case Exp.
Central Power & Light Company	21528	Securitization of Regulatory Assets
El Paso Electric Company	9945	Cost of Capital, Revenue Requirements, Decommissioning Funding
El Paso Electric Company	12700	Cost of Capital, Rate Moderation Plan, CWIP, Rate Case Expenses
Entergy Gulf States Incorporated	16705	Cost of Service, Rate Base, Revenues, Cost of Capital, Quality of Service
Entergy Gulf States Incorporated	21111	Cost Allocation
Entergy Gulf States Incorporated	21984	Unbundling
Entergy Gulf States Incorporated	22344	Capital Structure

Entergy Gulf States Incorporated	22356	Unbundling
Entergy Gulf States Incorporated	24336	Price to Beat
Gulf States Utilities Company	5560	Cost of Service
Gulf States Utilities Company	6525	Cost of Capital, Financial Integrity
Gulf States Utilities Company	6755/7195	Cost of Service, Cost of Capital, Excess Capacity
Gulf States Utilities Company	8702	Deferred Accounting, Cost of Capital, Cost of Service
Gulf States Utilities Company	10894	Affiliate Transaction
Gulf States Utilities Company	11793	Section 63, Affiliate Transaction
Gulf States Utilities Company	12852	Deferred acctng., self-Ins. reserve, contra AFUDC adj., River Bend Plant specifically assignable to Louisiana, River Bend Decomm., Cost of Capital, Financial Integrity, Cost of Service, Rate Case Expenses
GTE Southwest, Inc.	15332	Rate Case Expenses
Houston Lighting & Power	6765	Forecasting
Houston Lighting & Power	18465	Stranded costs
Lower Colorado River Authority	8400	Debt Service Coverage, Rate Design
Southwestern Electric Power Company	5301	Cost of Service
Southwestern Electric Power Company	4628	Rate Design, Financial Forecasting
Southwestern Electric Power Company	24449	Price to Beat Fuel Factor
Southwestern Bell Telephone Company	8585	Yellow Pages
Southwestern Bell Telephone Company	18509	Rate Group Re-Classification
Southwestern Public Service Company	13456	Interruptible Rates

Southwestern Public Service Company	11520	Cost of Capital
Southwestern Public Service Company	14174	Fuel Reconciliation
Southwestern Public Service Company	14499	TUCO Acquisition
Southwestern Public Service Company	19512	Fuel Reconciliation
Texas-New Mexico Power Company	9491	Cost of Capital, Revenue Requirements, Prudence
Texas-New Mexico Power Company	10200	Prudence
Texas-New Mexico Power Company	17751	Rate Case Expenses
Texas-New Mexico Power Company	21112	Acquisition risks/merger benefits
Texas Utilities Electric Company	9300	Cost of Service, Cost of Capital
Texas Utilities Electric Company	11735	Revenue Requirements
TXU Electric Company	21527	Securitization of Regulatory Assets
West Texas Utilities Company	7510	Cost of Capital, Cost of Service
West Texas Utilities Company	13369	Rate Design

RAILROAD COMMISSION OF TEXAS		
Energas Company	5793	Cost of Capital
Energas Company	8205	Cost of Capital
Energas Company	9002-9135	Cost of Capital, Revenues, Allocation
Lone Star Gas Company	8664	Rate Design, Cost of Capital, Accumulated Depr. & DFIT, Rate Case Exp.
Lone Star Gas Company-Transmission	8935	Implementation of Billing Cycle Adjustment
Southern Union Gas Company	6968	Rate Relief

Southern Union Gas Company	8878	Test Year Revenues, Joint and Common Costs
Texas Gas Service Company	9465	Cost of Capital, Cost of Service, Allocation
TXU Lone Star Pipeline	8976	Cost of Capital, Capital Structure
TXU-Gas Distribution	9145-9151	Cost of Capital, Transport Fee, Cost Allocation, Adjustment Clause
TXU-Gas Distribution	9400	Cost of Service, Allocation, Rate Base, Cost of Capital, Rate Design
Westar Transmission Company	4892/5168	Cost of Capital, Cost of Service
Westar Transmission Company	5787	Cost of Capital, Revenue Requirement
Atmos	10000	Cost of Capital

**TEXAS
WATER COMMISSION**

Southern Utilities Company	7371-R	Cost of Capital, Cost of Service
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**SCOTSBUFF, NEBRASKA CITY
COUNCIL**

K. N. Energy, Inc.		Cost of Capital
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**HOUSTON
CITY COUNCIL**

Houston Lighting & Power Company		Forecasting
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**PUBLIC UTILITY REGULATION BOARD OF
EL PASO, TEXAS**

Southern Union Gas Company		Cost of Capital
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**DISTRICT COURT
CAMERON COUNTY, TEXAS**

City of San Benito, et. al. vs. PGE Gas Transmission et. al.	96-12-7404	Fairness Hearing
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**DISTRICT COURT
HARRIS COUNTY, TEXAS**

City of Wharton, et al vs. Houston Lighting & Power	96-016613	Franchise fees
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**DISTRICT COURT
TRAVIS COUNTY, TEXAS**

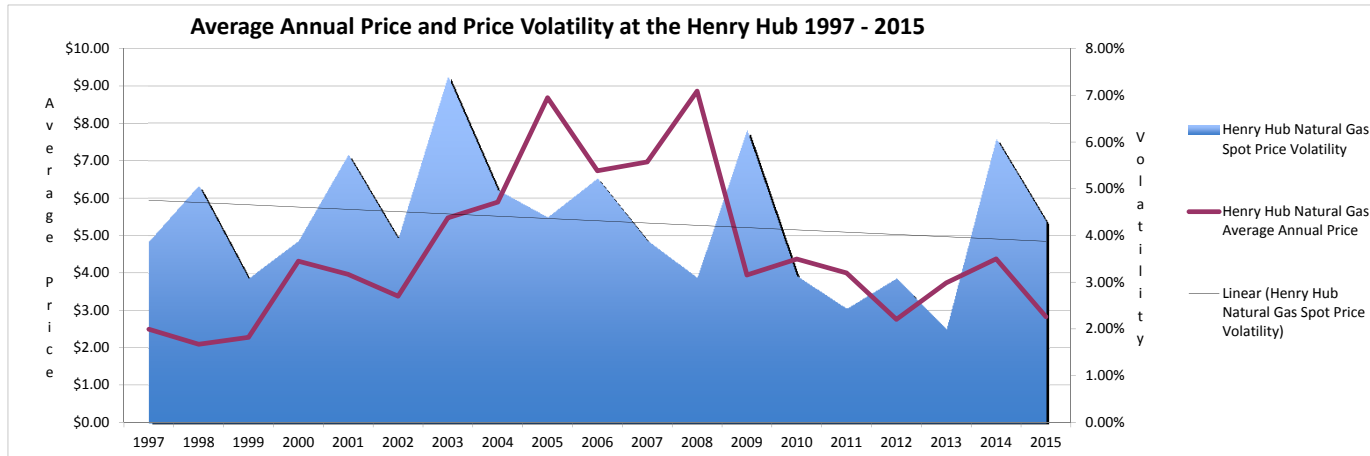
City of Round Rock, et al vs. Railroad Commission of Texas et al	GV 304,700	Mandamus
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SOUTH DAYTONA, FLORIDA

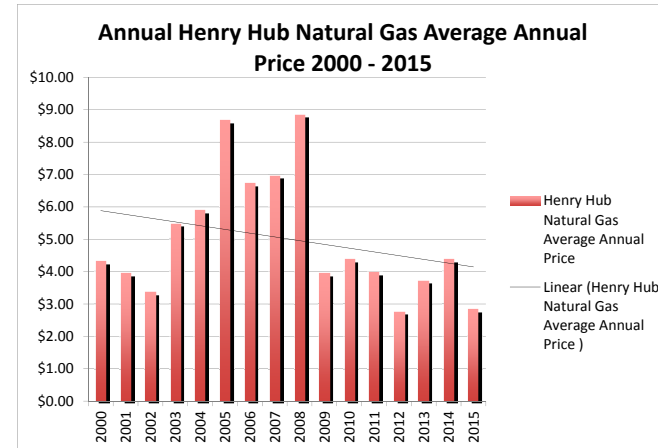
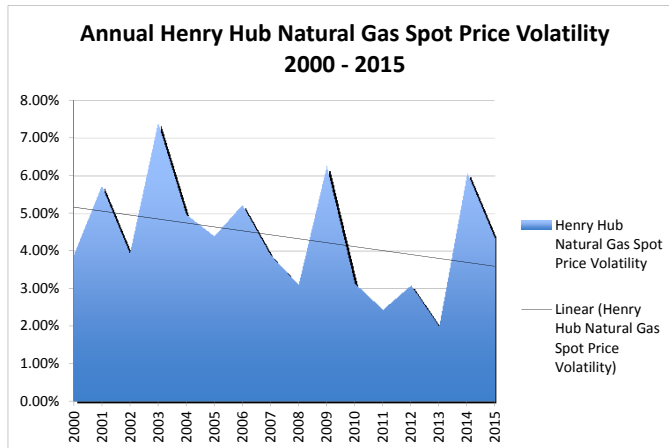
City of South Daytona v. Florida Power and Light	2008-30441-CICI	Stranded Costs
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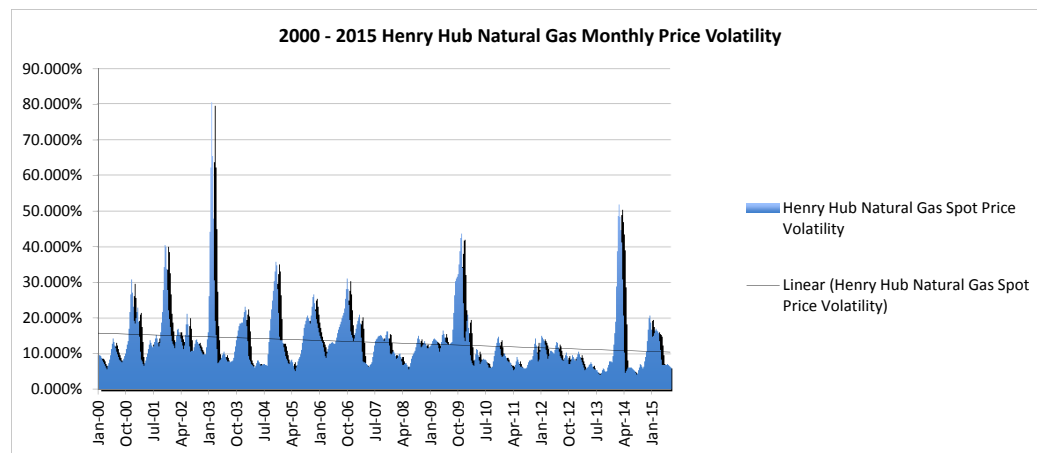
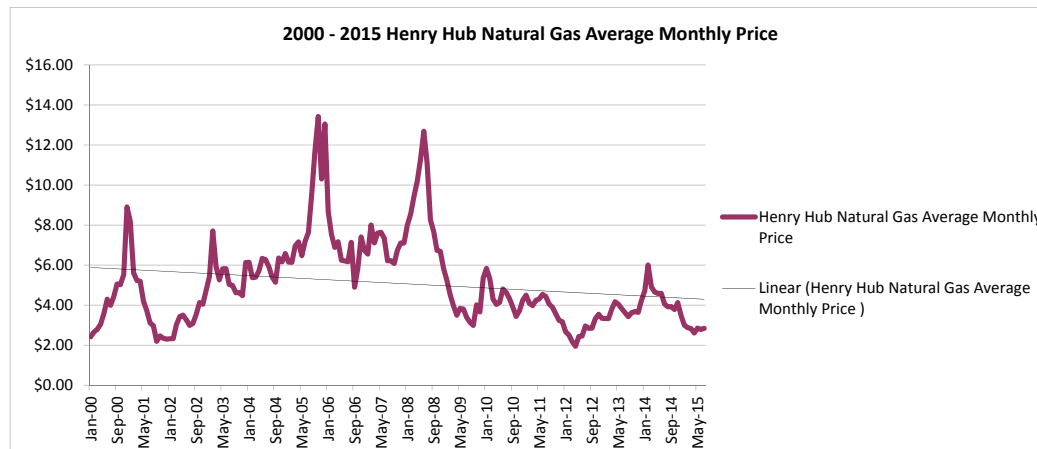
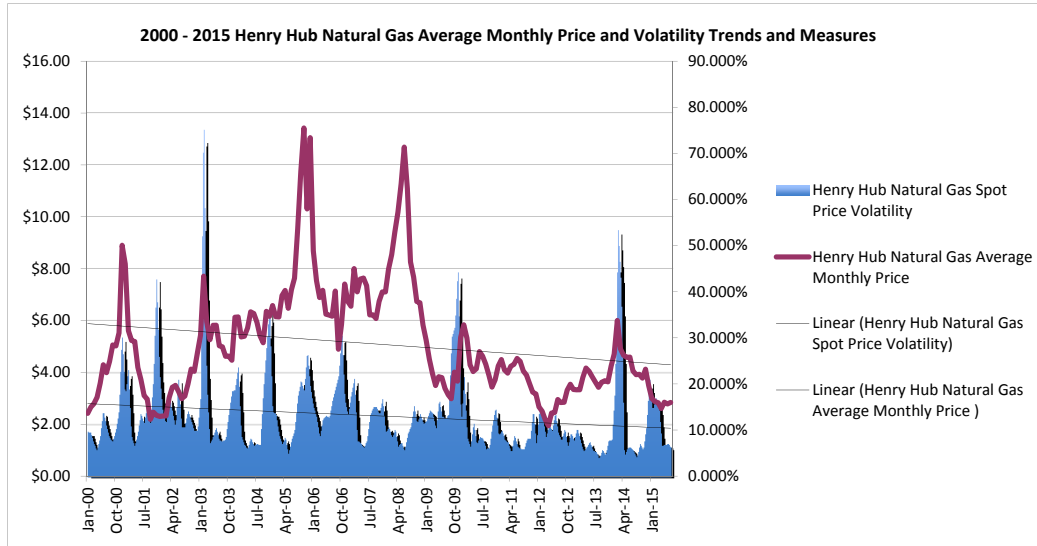
1997 - 2015 Henry Hub Natural Gas Price Historical Average Price and Price Volatility Measured Annually

Date	Henry Hub Natural Gas Spot Price Volatility	Henry Hub Natural Gas Average Annual Price
1997	3.88%	\$2.49
1998	5.08%	\$2.09
1999	3.09%	\$2.27
2000	3.89%	\$4.31
2001	5.74%	\$3.96
2002	3.94%	\$3.38
2003	7.42%	\$5.47
2004	4.98%	\$5.89
2005	4.40%	\$8.69
2006	5.23%	\$6.73
2007	3.90%	\$6.97
2008	3.11%	\$8.86
2009	6.26%	\$3.94
2010	3.14%	\$4.37
2011	2.45%	\$4.00
2012	3.09%	\$2.75
2013	2.00%	\$3.73
2014	6.08%	\$4.37
2015	4.31%	\$2.82
2000 to 2010	4.73%	\$5.69
2011 to 2015	3.59%	\$3.54
Change	-24.16%	-37.84%



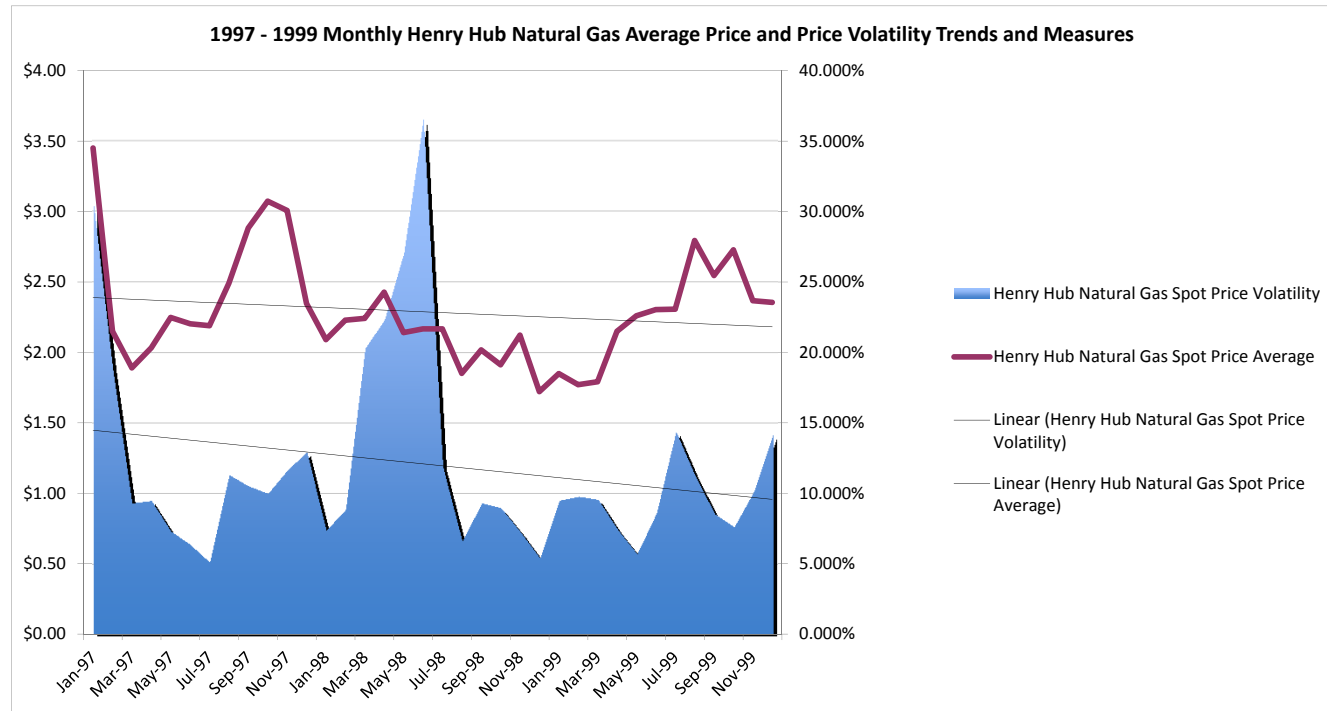
Date	Henry Hub Natural Gas Spot Price Volatility	Henry Hub Natural Gas Average Annual Price
2000	3.89%	\$4.31
2001	5.74%	\$3.96
2002	3.94%	\$3.38
2003	7.42%	\$5.47
2004	4.98%	\$5.89
2005	4.40%	\$8.69
2006	5.23%	\$6.73
2007	3.90%	\$6.97
2008	3.11%	\$8.86
2009	6.26%	\$3.94
2010	3.14%	\$4.37
2011	2.45%	\$4.00
2012	3.09%	\$2.75
2013	2.00%	\$3.73
2014	6.08%	\$4.37
2015	4.31%	\$2.82





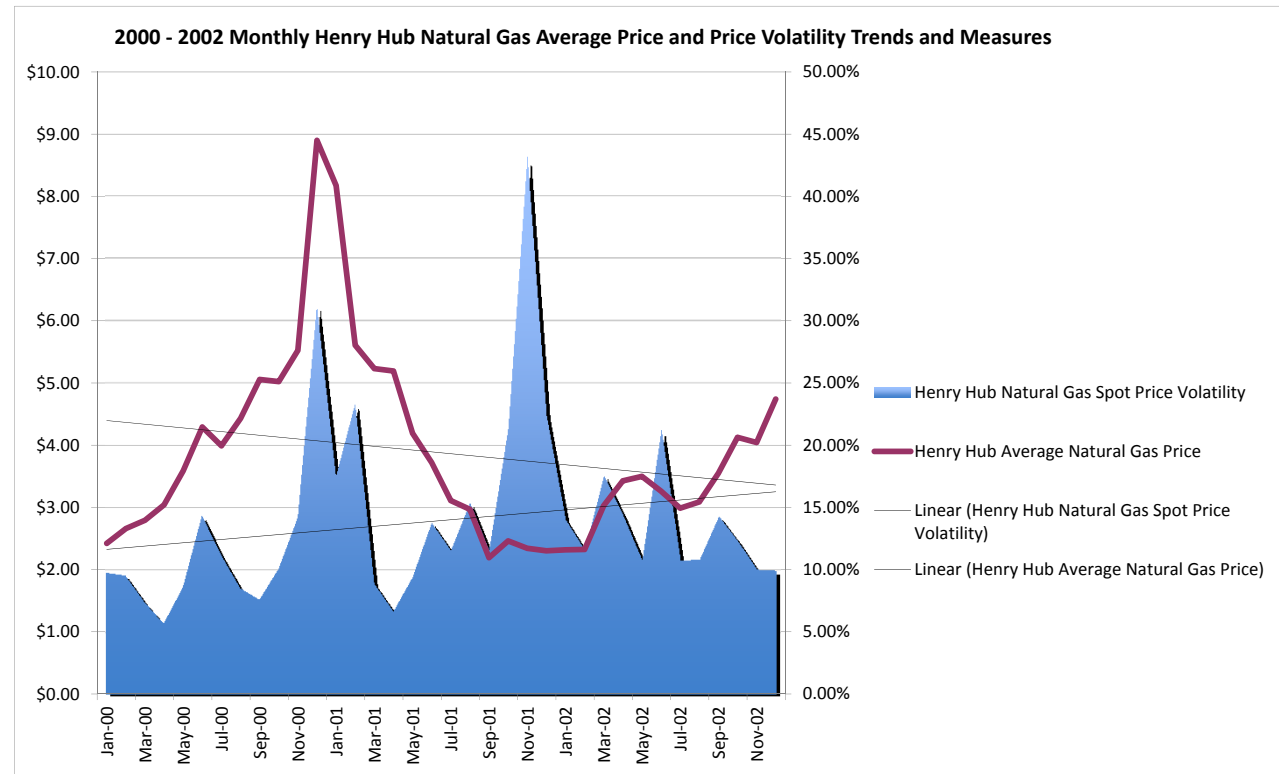
Dates	Price Volatility	Average Price
2000 - 2010	14.240%	\$5.70
2011 - 2015	10.219%	\$3.60
Change	-28.239%	-36.812%

Date	Henry Hub Natural Gas Spot Price Volatility	Henry Hub Natural Gas Spot Price Average
Jan-97	30.840%	\$3.45
Feb-97	18.945%	\$2.15
Mar-97	9.325%	\$1.89
Apr-97	9.497%	\$2.03
May-97	7.344%	\$2.25
Jun-97	6.377%	\$2.20
Jul-97	5.125%	\$2.19
Aug-97	11.322%	\$2.49
Sep-97	10.533%	\$2.88
Oct-97	10.002%	\$3.07
Nov-97	11.655%	\$3.01
Dec-97	12.948%	\$2.35
Jan-98	7.397%	\$2.09
Feb-98	8.876%	\$2.23
Mar-98	20.299%	\$2.24
Apr-98	22.317%	\$2.43
May-98	27.102%	\$2.14
Jun-98	36.587%	\$2.17
Jul-98	11.904%	\$2.17
Aug-98	6.605%	\$1.85
Sep-98	9.334%	\$2.02
Oct-98	8.977%	\$1.91
Nov-98	7.275%	\$2.12
Dec-98	5.428%	\$1.72
Jan-99	9.516%	\$1.85
Feb-99	9.792%	\$1.77
Mar-99	9.573%	\$1.79
Apr-99	7.443%	\$2.15
May-99	5.720%	\$2.26
Jun-99	8.622%	\$2.30
Jul-99	14.394%	\$2.31
Aug-99	11.208%	\$2.79
Sep-99	8.554%	\$2.55
Oct-99	7.639%	\$2.73
Nov-99	10.116%	\$2.37
Dec-99	14.229%	\$2.36
Avg	12.023%	\$2.29
Max	36.587%	\$3.45
Min	5.125%	\$1.72

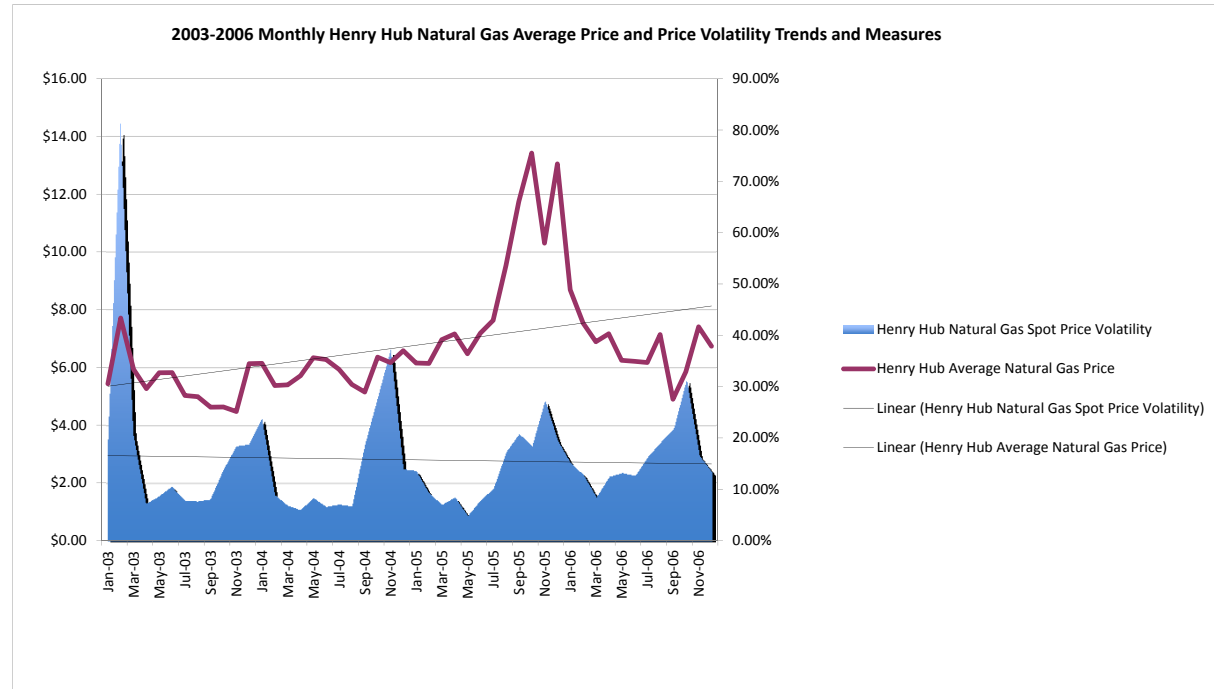


Date	Henry Hub Natural Gas Spot Price Volatility	Henry Hub Average Natural Gas Price
Jan-00	9.79%	\$2.42
Feb-00	9.57%	\$2.66
Mar-00	7.44%	\$2.79
Apr-00	5.72%	\$3.04
May-00	8.62%	\$3.59
Jun-00	14.39%	\$4.29
Jul-00	11.21%	\$3.99
Aug-00	8.55%	\$4.43
Sep-00	7.64%	\$5.06
Oct-00	10.12%	\$5.02
Nov-00	14.23%	\$5.52
Dec-00	31.23%	\$8.90
Jan-01	17.52%	\$8.17
Feb-01	23.35%	\$5.61
Mar-01	8.91%	\$5.23
Apr-01	6.69%	\$5.19
May-01	9.44%	\$4.19
Jun-01	13.80%	\$3.72
Jul-01	11.59%	\$3.11
Aug-01	15.39%	\$2.97
Sep-01	11.59%	\$2.19
Oct-01	21.40%	\$2.46
Nov-01	43.22%	\$2.34
Dec-01	22.42%	\$2.30
Jan-02	14.04%	\$2.32
Feb-02	11.61%	\$2.32
Mar-02	17.59%	\$3.03
Apr-02	14.41%	\$3.43
May-02	10.79%	\$3.50
Jun-02	21.31%	\$3.26
Jul-02	10.75%	\$2.99
Aug-02	10.87%	\$3.09
Sep-02	14.33%	\$3.55
Oct-02	12.31%	\$4.13
Nov-02	10.04%	\$4.04
Dec-02	9.96%	\$4.74

Avg	13.94%	\$3.88
Max	43.22%	\$8.90
Min	5.72%	\$2.19

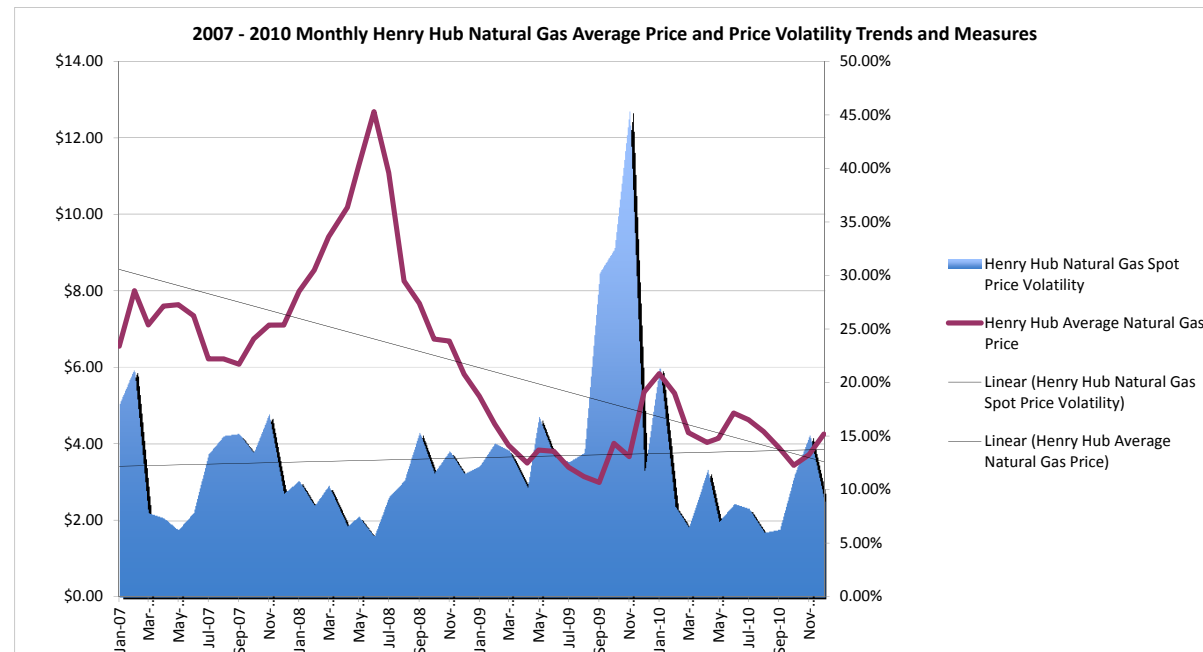


Date	Henry Hub Natural Gas Spot Price Volatility	Henry Hub Average Natural Gas Price
Jan-03	17.08%	\$5.43
Feb-03	81.52%	\$7.71
Mar-03	20.93%	\$5.93
Apr-03	7.29%	\$5.26
May-03	8.78%	\$5.81
Jun-03	10.68%	\$5.82
Jul-03	7.96%	\$5.03
Aug-03	7.79%	\$4.98
Sep-03	8.18%	\$4.62
Oct-03	13.87%	\$4.63
Nov-03	18.50%	\$4.47
Dec-03	18.90%	\$6.13
Jan-04	24.00%	\$6.14
Feb-04	9.07%	\$5.37
Mar-04	6.97%	\$5.39
Apr-04	6.09%	\$5.71
May-04	8.47%	\$6.33
Jun-04	6.75%	\$6.27
Jul-04	7.18%	\$5.93
Aug-04	6.82%	\$5.41
Sep-04	18.77%	\$5.15
Oct-04	28.02%	\$6.35
Nov-04	37.40%	\$6.17
Dec-04	14.05%	\$6.58
Jan-05	13.71%	\$6.15
Feb-05	9.36%	\$6.14
Mar-05	7.15%	\$6.96
Apr-05	8.60%	\$7.16
May-05	4.98%	\$6.47
Jun-05	8.01%	\$7.18
Jul-05	10.28%	\$7.63
Aug-05	17.46%	\$9.53
Sep-05	20.91%	\$11.75
Oct-05	18.50%	\$13.42
Nov-05	27.45%	\$10.30
Dec-05	19.52%	\$13.05
Jan-06	15.22%	\$8.69
Feb-06	12.91%	\$7.54
Mar-06	8.58%	\$6.89
Apr-06	12.60%	\$7.16
May-06	13.32%	\$6.25
Jun-06	12.76%	\$6.21
Jul-06	16.47%	\$6.17
Aug-06	19.31%	\$7.14
Sep-06	21.95%	\$4.90
Oct-06	31.54%	\$5.85
Nov-06	16.68%	\$7.40
Dec-06	13.39%	\$6.73
Avg	15.74%	\$6.73
Max	81.52%	\$13.42
Min	4.98%	\$4.47



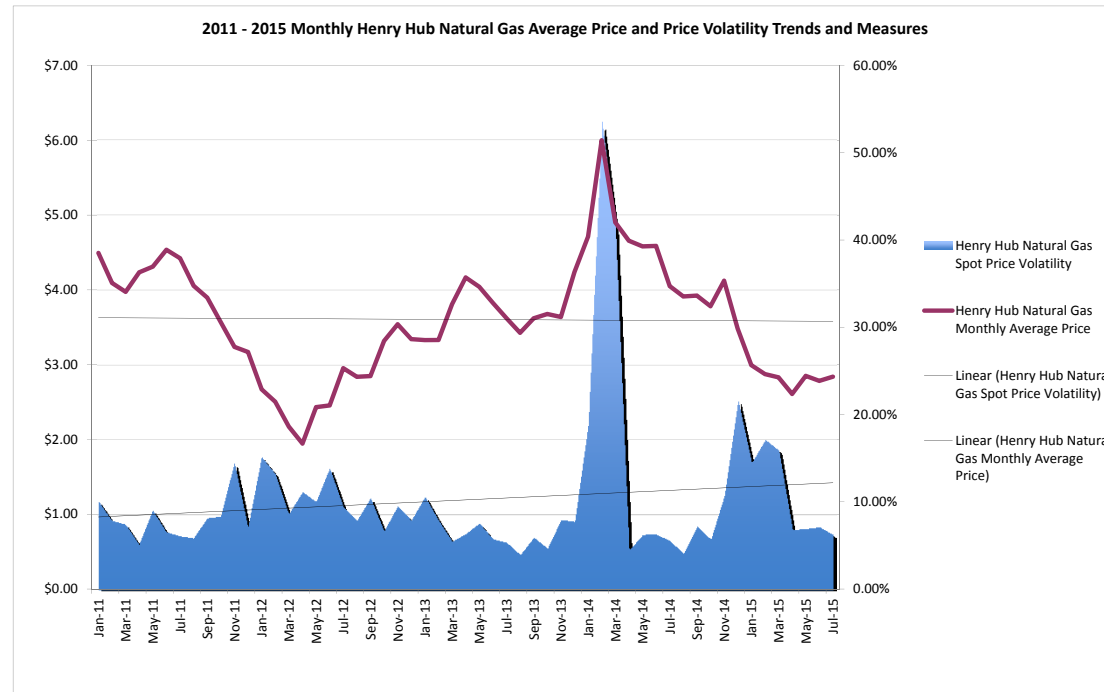
Date	Henry Hub Natural Gas Spot Price Volatility	Henry Hub Average Natural Gas Price
Jan-07	17.95%	\$6.55
Feb-07	21.34%	\$8.00
Mar-07	7.88%	\$7.11
Apr-07	7.41%	\$7.60
May-07	6.29%	\$7.64
Jun-07	7.90%	\$7.35
Jul-07	13.35%	\$6.22
Aug-07	15.05%	\$6.22
Sep-07	15.27%	\$6.08
Oct-07	13.49%	\$6.74
Nov-07	17.10%	\$7.10
Dec-07	9.67%	\$7.10
Jan-08	10.89%	\$7.99
Feb-08	8.55%	\$8.54
Mar-08	10.43%	\$9.41
Apr-08	6.65%	\$10.18
May-08	7.56%	\$11.27
Jun-08	5.67%	\$12.69
Jul-08	9.38%	\$11.09
Aug-08	10.88%	\$8.26
Sep-08	15.42%	\$7.67
Oct-08	11.61%	\$6.74
Nov-08	13.66%	\$6.68
Dec-08	11.53%	\$5.82
Jan-09	12.24%	\$5.24
Feb-09	14.37%	\$4.51
Mar-09	13.72%	\$3.96
Apr-09	10.30%	\$3.49
May-09	16.85%	\$3.83
Jun-09	13.13%	\$3.80
Jul-09	12.63%	\$3.38
Aug-09	13.49%	\$3.14
Sep-09	30.25%	\$2.99
Oct-09	32.48%	\$4.01
Nov-09	45.51%	\$3.66
Dec-09	11.57%	\$5.35
Jan-10	21.67%	\$5.83
Feb-10	8.49%	\$5.32
Mar-10	6.54%	\$4.29
Apr-10	11.90%	\$4.03
May-10	7.08%	\$4.14
Jun-10	8.72%	\$4.80
Jul-10	8.27%	\$4.63
Aug-10	6.06%	\$4.32
Sep-10	6.34%	\$3.89
Oct-10	11.44%	\$3.43
Nov-10	15.16%	\$3.71
Dec-10	8.97%	\$4.25

Avg	12.96%	\$6.04
Max	45.51%	\$12.69
Min	5.67%	\$2.99



Date	Henry Hub Natural Gas Spot Price Volatility	Henry Hub Natural Gas Monthly Average Price
Jan-11	10.15%	\$4.49
Feb-11	7.92%	\$4.09
Mar-11	7.48%	\$3.97
Apr-11	5.19%	\$4.24
May-11	9.10%	\$4.31
Jun-11	6.61%	\$4.54
Jul-11	6.14%	\$4.42
Aug-11	5.89%	\$4.05
Sep-11	8.20%	\$3.90
Oct-11	8.39%	\$3.57
Nov-11	14.56%	\$3.24
Dec-11	7.13%	\$3.17
Jan-12	15.20%	\$2.67
Feb-12	13.25%	\$2.50
Mar-12	8.67%	\$2.17
Apr-12	11.19%	\$1.95
May-12	10.07%	\$2.43
Jun-12	13.91%	\$2.46
Jul-12	9.51%	\$2.95
Aug-12	7.88%	\$2.84
Sep-12	10.50%	\$2.85
Oct-12	6.71%	\$3.32
Nov-12	9.59%	\$3.54
Dec-12	7.92%	\$3.34
Jan-13	10.64%	\$3.33
Feb-13	7.94%	\$3.33
Mar-13	5.53%	\$3.81
Apr-13	6.40%	\$4.17
May-13	7.61%	\$4.04
Jun-13	5.78%	\$3.83
Jul-13	5.40%	\$3.62
Aug-13	4.00%	\$3.43
Sep-13	5.98%	\$3.62
Oct-13	4.72%	\$3.68
Nov-13	8.01%	\$3.64
Dec-13	7.79%	\$4.24
Jan-14	19.02%	\$4.71
Feb-14	53.57%	\$6.00
Mar-14	41.33%	\$4.90
Apr-14	4.51%	\$4.66
May-14	6.30%	\$4.58
Jun-14	6.34%	\$4.59
Jul-14	5.57%	\$4.05
Aug-14	4.12%	\$3.91
Sep-14	7.23%	\$3.92
Oct-14	5.76%	\$3.78
Nov-14	10.81%	\$4.12
Dec-14	21.69%	\$3.48
Jan-15	14.52%	\$2.99
Feb-15	17.17%	\$2.87
Mar-15	15.91%	\$2.83
Apr-15	6.85%	\$2.61
May-15	6.97%	\$2.85
Jun-15	7.16%	\$2.78
Jul-15	6.26%	\$2.84

Avg	10.22%	\$3.60
Max	53.57%	\$6.00
Min	4.00%	\$1.95



Analysis of Absolute Value of Price Changes at the Henry Hub 1997 - 2015

YEAR	Henry Hub Natural Gas Spot Price Average	Absolute Price Change Average	YEAR	Absolute Price Change Count ≥ \$0.25	Absolute Price Change Count ≥ \$0.50	Absolute Price Change Count ≥ \$1.00
1997	\$2.48	\$0.07	1997	10	2	0
1998	\$2.09	\$0.06	1998	6	1	0
1999	\$2.27	\$0.05	1999	2	0	0
2000	\$4.31	\$0.14	2000	31	13	4
2001	\$3.96	\$0.14	2001	44	14	0
2002	\$3.38	\$0.10	2002	14	1	0
2003	\$5.47	\$0.26	2003	45	17	6
2004	\$5.89	\$0.19	2004	56	24	4
2005	\$8.69	\$0.29	2005	90	39	10
2006	\$6.73	\$0.26	2006	105	35	1
2007	\$6.97	\$0.20	2007	70	16	1
2008	\$8.86	\$0.20	2008	86	14	0
2009	\$3.94	\$0.16	2009	48	9	1
2010	\$4.37	\$0.10	2010	15	3	1
2011	\$4.00	\$0.07	2011	6	0	0
2012	\$2.75	\$0.07	2012	1	0	0
2013	\$3.73	\$0.06	2013	1	0	0
2014	\$4.37	\$0.15	2014	26	15	8
2015	\$2.82	\$0.06	2015	4	0	0

