Exhibit _ (JML-2A)

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Rebuttal Testimony and Exhibits of
Joseph M. Lynch
on Behalf of
South Carolina Electric & Gas Company in
Docket No. 2017-203-E

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REBUTTAL TESTIMONY

OF

JOSEPH M. LYNCH

ON BEHALF OF

SOUTH CAROLINA ELECTRIC & GAS COMPANY

DOCKET NO. 2012-203-E

Q. PLEASE STATE YOUR NAME AND OCCUPATION.

A. My name is Joseph M. Lynch and I am Manager of Resource Planning for South Carolina Electric & Gas Company ("SCE&G" or the "Company").

Q. DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I graduated from St. Francis College in Brooklyn, New York, with a Bachelor of Science degree in mathematics. From the University of South Carolina, I received a Master of Arts degree in mathematics, an MBA and a Ph.D. in management science and finance. I was employed by SCE&G as a Senior Budget Analyst in 1977 to develop econometric models to forecast electric sales and revenue. In 1980, I was promoted to Supervisor of the Load Research Department. In 1985, I became Supervisor of Regulatory Research where I was responsible for load research and electric rate design. In 1989, I became Supervisor of Forecasting and Regulatory Research, and in 1991, I was promoted to my current position of Manager of Resource Planning.

Q. WHAT ARE YOUR CURRENT DUTIES AS MANAGER OF RESOURCE PLANNING?

A. As Manager of Resource Planning I am responsible for producing SCE&G's forecast of energy, peak demand and revenue; for developing the Company's generation expansion plans; and for overseeing the Company's load research program.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC SERVICE COMMISSION?

A. I have, on a number of occasions.

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

A. My testimony points out certain problems with the positions asserted by the Sierra Club through the testimony of its witness Dr. Cooper. Specifically, I support Mr. Marsh's testimony that points out the problems in the analytical approach that Dr. Cooper uses. I provide further support for Mr. Marsh's conclusion that natural gas prices are highly volatile, and that our knowledge of future natural gas prices is too limited and uncertain to allow a utility to rely on a single forecast of future prices in planning for future base load generation capacity. All other considerations aside, I also show that because of the investment that SCE&G has made to date in the V. C. Summer Nuclear Units 2 and 3 (the "Units"), going forward with construction of them is clearly superior from a pure cost basis even assuming low natural gas prices.

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Q. DO YOU AGREE WITH MR. MARSH'S ASSESSMENT OF THE FLAWS IN DR. COOPER'S ANALYSIS?

A. I agree that Dr. Cooper's analysis is flawed for many reasons. Most importantly, he looks only at one set of data as to future gas costs. This is not how utility planning decisions are made. Mr. Marsh's testimony explains this very well.

Q. IN HIS DIRECT TESTIMONY DR. COOPER ARGUES THAT THE "COLLAPSE OF GAS PRICES HAS BEEN DRAMATIC" AND THAT THE EIA IS CURRENTLY PROJECTING NATURAL GAS PRICES TO BE 62% LESS THAN SCE&G'S BASELINE PROJECTIONS IN THE 2008 CASE. SHOULD SCE&G ABANDON CONSTRUCTION OF ITS NUCLEAR UNITS BECAUSE OF THIS?

A. Of course not. The natural gas markets experience a great deal of volatility in prices and planners see as much or more volatility in the projections of future natural gas prices. In Exhibit No. __ (JML-1), I show a graph of EIA's current natural gas price projections using data contained in their Annual Energy Outlook ("AEO") 2012 forecast as well as that contained in their AEO 2009 forecast. The 2012 forecast is about 60% or so less than their 2009 forecast. So three years ago the EIA did not foresee that a dramatic collapse in natural gas prices coming. By the same token, EIA may not be able to foresee a dramatic reversal in prices in another three years if that were coming.

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Q. DO YOU PUT MUCH CONFIDENCE IN THE EIA'S NATURAL GAS PRICE PROJECTIONS?

A. Planners, if they are prudent, do not put much confidence in anyone's projection of natural gas prices. That is why almost all resource planning studies involve scenario planning and sensitivity analysis around the most uncertain drivers of cost. The price of fossil fuels is one of the most volatile and uncertain drivers of energy costs. Each year the EIA publishes an analysis of the accuracy of its natural gas price forecast. Exhibit No. __ (JML-2) shows a portion of EIA's error analysis of its natural gas price projections, which shows the percent error in their past forecasts. An important thing to notice in the table is that most entries show sizable errors even in short term predictions and there is no entry with a 0% error. This means that the EIA's forecast is almost always wrong. It is only a question of how wrong.

Q. DOES THE EIA PROVIDE SOME INDICATION OF THE UNCERTAINTY SURROUNDING ITS NATURAL GAS PROJECTIONS?

A. It does. The error analysis I just discussed provides one indication of uncertainty. Another is a confidence interval that the EIA publishes with respect to its projection of short-range prices. In Exhibit No. __ (JML-3), I show an EIA chart containing a 95% confidence interval that EIA has computed around its forecast of gas prices through 2013. This chart suggests the possibility of prices in December 2013 reaching as high as $7.76 per MMBTU and as low as $2.11 with

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an expected price of $3.63. Clearly the EIA sees much uncertainty in its forecasts of gas prices even in the next two years.

Q. IS THE UNCERTAINTY IN NATURAL GAS PRICES BALANCED, THAT IS, IS THE RISK OF HIGHER PRICES JUST AS GREAT AS THE RISK OF LOWER PRICES?

A. No, the risk of higher prices is much greater than the risk of lower prices. Common sense and economics would suggest that natural gas producers would not produce and sell gas at a loss, at least not for very long, so there is a floor on how low gas prices can go. On the other hand, experience tells us that, if there is a ceiling, it is fairly high. The unbalanced nature of price risk for natural gas can be demonstrated in EIA's confidence interval I just discussed. The upper bound of the 95% confidence interval is 214% greater than the mean forecast while the lower bound is 42% lower. This means that there is an equal probability of prices being 214% higher as there is of them being 42% lower than the expected price. Clearly the upside risk is greater.

Q. ARE THERE ECONOMIC FORCES THAT WOULD TEND TO PUSH NATURAL GAS PRICES HIGHER?

A. Yes. There are two categories of factors that come to mind: supply and demand forces and environmental regulations. As to supply and demand, natural gas prices are low now because of an abundance of supply being provided by the new production technology of hydraulic fracturing, or fracking. Because of the low prices, the demand for natural gas is increasing and this will put upward

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pressure on the price. For example, natural gas generation is displacing a high percentage of coal generation in the day-to-day dispatch of generating systems throughout the country. This will tend to push the cost of gas generation toward the cost of coal generation, which in today's market is higher. In the longer term, there are gas exporters seeking authority to build liquefaction capacity to sell domestically produced natural gas in the international market.[1] Today, U.S. prices for natural gas are much lower than prices internationally.[2] If export sales increase, this will increase demand for domestically produced natural gas. A high level of exports would link domestic prices more closely to the global energy market and global prices. Furthermore, low gas prices in the United States are leading to expansion in gas-intensive industries like petrochemicals, pharmaceuticals and other businesses that use gas as a chemical feedstock or energy source.[3]

As to environmental regulations, the effect of environmental regulations will take at least two forms. Recently promulgated EPA air emissions regulations, such as those Mr. Byrne discusses, are forcing the early retirement of coal capacity which cannot economically be scrubbed. Given the cost of carbon sequestration, newly issued CO_2 regulations have taken new coal generation off the table as a

[1] Project sponsors are seeking Federal approval to export domestic natural gas" April 24, 2012, http://www.eia.gov/todayinenergy/detail.cfm?id=5970/.
[2] Id.
[3] Accenture, North America Flexes it Manufacturing Muscle,http://www.accenture.com/us-en/outlook/Pages/outlook-journal-2012-north-america-flexes-industrial-muscle.aspx?c=mc_myoutlook3-_10000009&n=emc_0712

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means for meeting future electric demand. Electric utilities will be meeting much of their future capacity needs through the addition of new gas fired generation. This will increase the demand for natural gas and put still more upward pressure on gas prices. Increasing reliance of natural gas as a fuel for electric generation will also create the need for new pipeline capacity to deliver gas in the required volumes, which involves construction and permitting costs and risks, which can lead to higher costs. Of course, if you burn gas, you emit carbon, so another risk of gas generation is the risk that CO_2 costs will be imposed directly on gas as a fuel.

The other form of regulation deals with the technique of fracking. There is concern in the environmental community that the technique is harmful to the environment and requires more regulation. Such regulations would increase the cost of producing natural gas and as a result would also increase the price of gas in the market. How these developments will progress is uncertain, but they indicate that there are forces at work in the economy that could cause today's forecasts of future gas prices to prove inaccurate.

Q. WHY DO YOU SAY THAT COAL IS "OFF THE TABLE" FOR ELECTRIC GENERATION TODAY?

A. On May 27, 2012, the Environmental Protection Agency issued new regulations based on a finding that CO_2 should be regulated as an air pollutant. The new regulations require all new or refurbished electric generation facilities to meet CO_2 discharge limits which are based on the expected emissions from a combined-cycle natural gas generation unit. This means that given current state of

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carbon sequestration technology, new coal generation or refurbished coal plants are not likely to be permitted for operation in the United States. Apart from nuclear generation, there is now only one type of dispatchable base load/intermediate load generation resource that can be built in most of the United States. That is combined-cycle gas generation.

Q. DR. COOPER ESTIMATES THAT THE LOW GAS PRICES CURRENTLY PROJECTED BY THE EIA IMPLIES A $115 MILLION REDUCTION IN THE LEVELIZED COST OF A NATURAL GAS FIRED GENERATION STRATEGY AND THAT SCE&G SHOULD THEREFORE ABANDON THE CONSTRUCTION OF ITS NUCLEAR UNITS FOR ECONOMIC REASONS. DO YOU AGREE?

A. Absolutely not. I have demonstrated that there is a great deal of uncertainty in natural gas prices and in their projection. Prudent resource planning decisions cannot be made based on a single scenario of natural gas price projections. I have also shown that the likelihood of higher gas prices is much greater than that of likelihood of lower gas prices. Therefore, there is a greater likelihood that the $115 million advantage that Dr. Cooper calculates will decrease or disappear than that this advantage will get larger.

Q. FOR THE SAKE OF ARGUMENT ASSUME THAT SCE&G PUTS ASIDE THE PRUDENT PRACTICE OF USING SCENARIO PLANNING AND SENSITIVITY ANALYSIS IN RESOURCE PLANNING STUDIES AND ACCEPTS DR. COOPER'S APPROACH OF USING ONE SCENARIO OF

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LOW GAS PRICES OVER 40 YEARS TO MAKE PLANNING DECISIONS. WOULD YOU AGREE BASED ON THE RESULTING ECONOMICS THAT SCE&G SHOULD ABANDON ITS NUCLEAR CONSTRUCTION AND BUILD NATURAL GAS FIRED GENERATION?

A. Absolutely not. Assuming that natural gas prices will be low for the next 40 years and further assuming that Dr. Cooper is correct in his calculation that this results in a $115 million reduction in the levelized cost of a natural gas generation strategy, you still need to look at those important drivers of cost that have changed related to the nuclear generation strategy going forward.

Q. PLEASE EXPLAIN.

A. At least two changes have occurred since the original studies were run that would make a material difference in the cost of the nuclear strategy. One relates to the cost of the Units. In his direct testimony Mr. Byrne notes that the projected cost of the nuclear construction is about 8.7% or $551 million lower than the forecasts on which the original studies were run. Over a 40-year period, the levelized carrying cost of investing in nuclear generation is 16%. This means that on a levelized basis, every dollar invested in the Units equates to $0.16 per year in capital related costs on average during the 40-year period. This levelized carrying cost includes all the costs of carrying the nuclear investment, including depreciation, taxes, insurance, interest and so forth. Using a 16% levelized carrying charge for nuclear investments, and applying it to the $551 million reduction in the cost of the Units we are now forecasting, we can compute the

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difference that this reduction in cost makes to the levelized cost of the nuclear generation strategy. The result is that because of the $551 million reduction in the construction cost forecast, the levelized cost of nuclear generation is reduced by about $88 million ($551 million * 0.16%) per year over the 40 year planning horizon for the study.

Furthermore it is well recognized in utility planning practice that when making decisions about investments going forward, it is only the going-forward costs that are relevant. These are the costs that are left to be spent. If the question is whether or not SCE&G should complete the nuclear Units, only the cost of completing the Units is relevant.

In Exhibit 1 of her testimony, Ms. Walker reports that about 25% of the construction costs for the Units have already been spent and 75% remain to be spent to complete the project. This means that the levelized cost of the nuclear generation scenario should be reduced by $230 million ($5,762 million * 0.16 * 0.25), where $5,762 million is the current cost of the Units, 25% is the amount that has been spent and 16% is the levelized carrying cost of nuclear investment. Thus to update the 2008 study to current conditions, the levelized cost of the nuclear generation strategy should be reduced by a total of $318 million to reflect the fact that the cost of the Units has declined by $551 million and only 75% of that lower cost remains to be spent.

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Q. WHAT ABOUT THE ADDITIONAL COSTS THAT SCE&G MIGHT HAVE TO PAY TO ITS CONTRACTORS AND OTHERS TO ABANDON THE UNITS AT THIS TIME?

A. As Mr. Byrne discusses, SCE&G would have to pay additional costs to its contractors and others to abandon construction of the Units and switch to a gas strategy. Those costs have not been quantified. But at this point in the project, incurring them would be a necessary part of moving to a gas strategy. Because these costs are not included in my analysis, it understates the advantages that the nuclear strategy has over gas to that extent. But this would only cause the advantage of nuclear strategy to go up. The cost of abandonment would increase the value of continuing with nuclear construction compared to switching to a gas strategy.

Q. WHAT THEN IS YOUR CONCLUSION BASED ON THE UPDATED ECONOMICS?

A. The economics clearly demonstrate that the nuclear construction should continue. Given current capital cost forecasts and the value of investment to date, the levelized cost of the nuclear generation strategy is reduced by $318 million. Even if the levelized cost of the gas generation strategy is reduced by $115 million as Dr. Cooper suggests, the nuclear strategy maintains its economic advantage by a wide margin.

Q. WHICH ADJUSTMENT DO YOU CONSIDER THE MOST RELIABLE -- DR. COOPER'S ADJUSTMENT OF $115 MILLION BASED ON AN

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ASSUMPTION OF LOW GAS PRICES OVER THE NEXT 40 YEARS OR THE $318 MILLION ADJUSTMENT BASED ON THE NUCLEAR CONSTRUCTION COSTS?

A. I have much more confidence in the $318 million adjustment than the $115 million. More than two-thirds of the cost left to be spent under the EPC contract are fixed or subject to fixed escalation rates. Of course the 25% of the cost of the Units that has already been spent is fully known and measurable. On the other hand, I have already discussed the volatility and uncertainty of prices in the natural gas market. The $115 million adjustment to the natural gas generation strategy is based on an assumption of low gas prices over the next 40 years which is very uncertain. All indications are that the uncertainty of the gas price forecast is much greater that the uncertainty surrounding the cost of completing the construction cost of the Units.

Q. DR. COOPER TESTIFIES THAT THE COST OF THE NATURAL GAS GENERATION STRATEGY COULD BE REDUCED BY AS MUCH AS $200 MILLION IF A ZERO COST FOR CO_2 EMISSIONS IS ASSUMED IN ADDITION TO LOW NATURAL GAS PRICES. HAVE YOU CONSIDERED THIS IN YOUR ANALYSIS?

A. In its 2008 studies, SCE&G had assumed in its base case scenario a cost of $15 per ton of CO_2 emitted which gave the nuclear strategy an $88 million advantage over the natural gas generation strategy in levelized costs.

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Dr. Cooper testifies at one point that if a zero cost per CO_2 ton is assumed, then the $87 million could be added to the $115 million discussed above thereby producing a $200 million reduction in levelized costs for the natural gas generation strategy. However, Dr. Cooper subsequently testifies that the Commission cannot "ignore the carbon issue" so I assumed that his discussion about a $200 million reduction was meant more as commentary than serious economic analysis.

Q. CAN THE COMMISSION IGNORE THE CARBON ISSUE?

A. I agree with Dr. Cooper that the Commission cannot ignore the carbon issue. The EPA has ruled that CO2 emissions endanger human health, and the U.S. Supreme Court has ruled that under the Clean Air Act if the EPA makes such an endangerment finding, then it must regulate CO_2 emissions. Carbon emission cost, by the way, can come as taxes, cap and trade mechanisms, or mandatory capture and sequestration requirements. Each of these approaches imposes costs. For purpose of our studies, what form these costs takes is not particularly important.

Q. ASSUME FOR ARGUMENT SAKE THAT THE EPA REVERSES ITS ENDANGERMENT FINDING AND THAT THE COST OF CO_2 EMISSION IS ZERO IN THE FUTURE AND ASSUME FURTHER THE NATURAL GAS PRICES STAY LOW OVER THE NEXT 40 YEARS AND CONSEQUENTLY THAT THE NATURAL GAS GENERATION STRATEGY IS $200 MILLION LESS RELATIVE TO THE NUCLEAR

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STRATEGY IN LEVELIZED COSTS. BASED ON ECONOMICS SHOULD SCE&G ABANDON THE NUCLEAR CONSTRUCTION AND BUILD GAS FIRED PLANTS UNDER THESE ASSUMPTIONS?

A. Absolutely not. First I should repeat that important resource planning decisions should be based on thorough studies using scenario planning and sensitivity analysis. All that Dr. Cooper's analysis demonstrates is that scenarios can be imagined in which gas might be more economical than nuclear. Even accepting Dr. Cooper's approach, which I cannot do, SCE&G should not abandon the nuclear construction because, as already discussed, updated information on construction costs show at least a $318 million reduction in the cost of the nuclear strategy based on where we stand today. Even when compared to the $200 million reduction for the natural gas strategy which Dr. Cooper puts forward, and which even he does not seem to fully accept, the economic advantage of the nuclear strategy remains.

Q. DR. COOPER MENTIONS A SAVINGS OF $4 BILLION AND POSSIBLY AS MUCH AS $8 BILLION ASSOCIATED WITH HIS ANALYSIS. WHAT DO THESE NUMBERS REPRESENT AND HOW DO THEY RELATE TO THE LEVELIZED COSTS THAT YOU HAVE BEEN DISCUSSING?

A. While Dr. Cooper does not specify how he made his calculation, it seems that his $8 billion number was calculated as the product of 40 years times the annual average levelized savings of $200 million. He makes a similar calculation based on his $115 million levelized savings assertion, and calculates a $4 billion

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savings. This is not how this calculation would be made in the planning context. The approach that would be used in the planning context would be to compute a present value which is a standard calculation used in economic analysis to determine the accumulated present value of a future revenue stream.

Q. PLEASE EXPLAIN.

A. The accumulated present worth of a future revenue stream gives you the value today of a stream of payments or savings going out into the future. The calculation uses a present value factor that is typically calculated using the cost of capital for the entity in question. Using a weighted cost of capital of 8.7%, which is SCE&G's actual weighted average cost of capital as of December 31, 2011, the accumulated present value factor for a 40-year levelized stream of dollars is 12.05. Thus the accumulated present value for the $200 million levelized stream is $2.4 billion (12.05*$200 million) not $8 billion. A similar calculation can be made for Dr. Cooper's levelized savings calculation of $115 million. In this case the accumulated present value is $1.4 billion (12.05 * $115 million) as opposed to the $4 billion reported by Dr. Cooper.

Q. HOW WOULD YOUR NUMBERS REFLECTING INCREASED SAVINGS FOR THE NUCLEAR STRATEGY COMPARE ON A PRESENT VALUE BASIS?

A. I computed an increase in the levelized savings for the nuclear strategy of $318 million resulting from the reduced capital costs of completing the nuclear Units. The present value of this amount over the planning horizon is $3.9 billion, which compares to the present value of Dr. Cooper's asserted savings for the gas

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strategy ($115 million levelized with $15 CO_2 costs) of $1.4 billion. Even accepting Dr. Cooper's assumptions as to future gas prices, the cost reduction he computes in the gas strategy is less than half the saving in the nuclear strategy. Compared to $200 million in levelized savings that Dr. Cooper computed, which he admits improperly assumes no CO_2 costs, the results are $2.4 billion in savings for the gas strategy compared to $3.9 billion in savings for the nuclear strategy. Even assuming no CO_2 costs, nuclear savings are still over 60% greater than the savings for gas. Clearly, at this point in the project continuing construction of the nuclear Units is more economical by a very wide margin than abandoning them and pursuing a natural gas strategy. The comparisons are set out in the Chart A, below.

Chart A

Dr. Cooper's Adjustments to Natural Gas Strategy Costs (reduced costs, in millions)	
Low Gas Cost	
Levelized Per Year	$115
Accumulated	$4,000
Present Value	**$1,400**
Low Gas Cost & No CO_2 Cost	
Levelized Per Year	$200
Accumulated	$8,000
Present Value	**$2,400**

SCE&G's Adjustments to Nuclear Strategy Costs (reduced costs, in millions)	
Going-Forward Cost[1]	
Levelized Per Year	$318
Accumulated	-[2]
Present Value	**$3,900**

[1] Reflecting reduced construction cost of $551 million and the fact that 25% of the reduced cost of the project has already been spent.
[2] Not computed.

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Q. DOES SCE&G SEE AN ADVANTAGE TO ITS NUCLEAR GENERATION STRATEGY THAT GOES BEYOND THE ECONOMIC ISSUES BROUGHT UP BY DR. COOPER AND ADDRESSED IN YOUR TESTIMONY?

A. Yes, it does. Under its nuclear strategy SCE&G will achieve a balanced mix of capacity. In 2019 SCE&G will have 31% nuclear generation, 28% natural gas and 27% coal. This puts SCE&G in a good position to protect its customers and mitigate the cost impacts from the volatility of fossil fuel prices and the uncertainty of future environmental regulations on fossil fuels.

Q. DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

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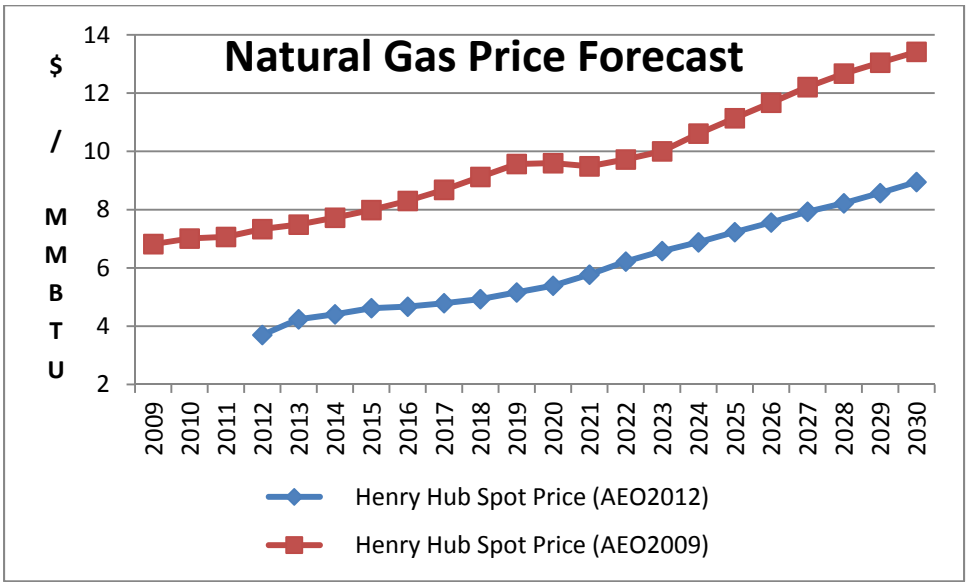

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Projected vs. actual (percent difference)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
AEO 1994	-19.0	-21.5	13.4	-26.4	-29.5	-42.9	-29.4	-21.4	-33.6	51.5	43.3
AEO 1995	-30.2	-27.6	7.1	-27.1	-29.1	-41.8	-28.6	-22.4	-35.3	47.5	36.1
AEO 1996	-40.4	-42.8	-19.4	-49.3	-52.6	-62.9	-55.6	-52.5	-60.9	-10.2	-16.2
AEO 1997	-43.9	-46.6	-25.0	-52.5	-55.5	-65.3	-58.5	-55.7	-63.9	-18.3	-25.2
AEO 1998	-37.2	-40.5	-17.1	-48.4	-52.5	-63.3	-56.3	-53.2	-61.6	-12.7	-19.5
AEO 1999	-40.1	-42.1	-17.8	-48.1	-51.8	-62.4	-54.6	-51.7	-60.8	-11.9	-19.5
AEO 2000	-39.3	-43.3	-21.4	-50.9	-54.0	-63.7	-56.0	-52.5	-61.1	-12.9	-21.0
AEO 2001	-7.8	-12.9	0.8	-43.9	-50.5	-61.4	-53.9	-51.0	-60.2	-11.3	-19.4
AEO 2002		0.6	-30.1	-48.1	-47.9	-59.0	-51.0	-48.3	-57.4	-4.2	-12.3
AEO 2003			-5.6	-33.2	-42.8	-57.1	-50.8	-47.1	-56.0	0.9	-5.0
AEO 2004				1.9	-26.8	-49.3	-41.7	-38.2	-48.9	8.2	-4.0
AEO 2005					-1.4	-24.7	-22.6	-26.9	-46.9	14.8	0.5
AEO 2006						6.5	12.1	4.4	-21.3	61.4	36.7
AEO 2007							7.5	12.1	-11.3	80.2	53.8
AEO 2008								1.9	-13.8	95.5	64.5
AEO 2009									1.1	12.2	15.7
AEO 2010										-7.9	0.2
AEO 2011											-1.0
Average Absolute Percent Difference	32.2	30.9	15.8	39.1	41.2	50.8	41.3	36.0	43.4	27.2	21.9

Sources: Projections: *Annual Energy Outlook*, Reference Case Projections, Various Editions.

Historical Data: U.S. Energy Information Administration, Annual Energy Review 2010, DOE/EIA-0384(2010) (Washington, DC, October 2011) Table 6.7.

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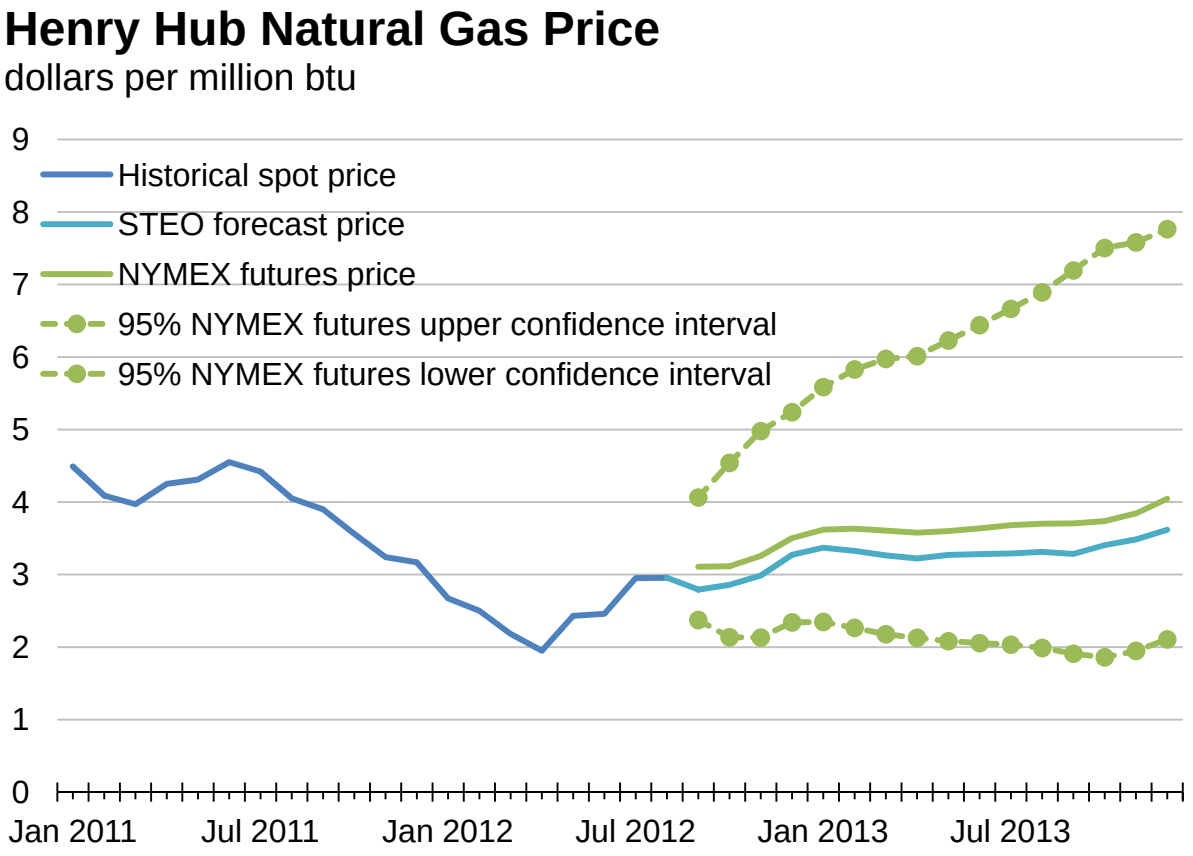

Source: Short-Term Energy Outlook, August 2012

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