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**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION**

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD PANEL

In the Matter of South Texas Project Nuclear Operating Co. Application for the South Texas Project Units 3 and 4 Combined Operating License	Docket Nos. 52-012, 52-013 April 22, 2010
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**DIRECT TESTIMONY

OF

CLARENCE L. JOHNSON**

**ON BEHALF OF THE

INTERVENORS**

April 9, 2011

**DIRECT TESTIMONY OF CLARENCE JOHNSON
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1 I. INTRODUCTION

2 Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

3 A. My name is Clarence Johnson. My address is 3707 Robinson Ave., Austin, Texas 78722.

4 Q. ON WHOSE BEHALF ARE YOU PRESENTING TESTIMONY IN THIS
5 PROCEEDING?

6 A. I am presenting testimony on behalf of the Intervenors.

7 Q. WHAT IS YOUR CURRENT EMPLOYMENT?

8 A. I am self-employed as a consultant who provides technical analysis and advice regarding
9 energy and utility regulatory issues.

10 Q. DO YOU HAVE PREVIOUS EXPERIENCE AS AN EXPERT ON REGULATED
11 UTILITY MATTERS IN TEXAS?

12 A. Yes. I have over 25 years of experience as a professional staff person for the Texas
13 Office of Public Utility Counsel ("OPC"). As a consultant, I have provided advice,
14 assistance, and testimony on utility-related issues to a number of parties.

15 Q. WHAT WERE YOUR RESPONSIBILITIES WITH OPC?

16 A. As OPC's Director of Regulatory Analysis, I was the professional staff person with the
17 primary responsibility for advising the OPC on economic and regulatory policy issues.
18 My responsibilities included reviewing utility rate applications, recommending actions or
19 positions to be taken by the Office, preparing and presenting expert testimony, and
20 working with other experts employed or retained by OPC to coordinate the agency's
21 technical evidentiary positions. I also held supervisory responsibilities with respect to

1 OPC's technical analysis staff. In addition, my responsibilities included providing
2 technical assistance on legislative matters.

3 **Q. HAVE YOU PROVIDED AN ATTACHMENT WHICH DETAILS YOUR**
4 **EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE?**

5 A. Yes. Please see Attachment A.

6 **Q. PLEASE OUTLINE YOUR EDUCATIONAL AND PROFESSIONAL**
7 **BACKGROUND.**

8 A. I have a B.S. in Political Science and a M.A. in Urban Studies from the University of
9 Houston. My graduate degree is in an interdisciplinary program offered by the
10 University of Houston's College of Social Science which incorporated substantial
11 training in economics, including course work in the application of cost-benefit analysis to
12 public policy. During my 25-year tenure at OPC, I gained experience in virtually all
13 phases of economic review required for the ratemaking process. I was chairman of the
14 Economics and Finance Committee of the National Association of State Utility
15 Consumer Advocates ("NASUCA") and served as a presenter for NASUCA's workshops
16 and panels on cost allocation and rate design, DSM incentives, market power and electric
17 utility competition. Also, at various times, I have undergone training in specific subjects
18 such as electric wholesale market design, cogeneration engineering and Electric
19 Reliability Council of Texas ("ERCOT") operations.

1 **Q. DO YOU HAVE EXTENSIVE EXPERIENCE AS AN EXPERT WITNESS?**

2 A. Yes. I have previously filed testimony in more than 100 proceedings at the Public Utility
3 Commission of Texas and the Pennsylvania Public Utilities Commission. With a few
4 exceptions, the testimony has addressed electric rate issues. A listing of cases in which I
5 have testified is included in Attachment A.

6 **Q. WHAT IS THE SCOPE OF YOUR TESTIMONY IN THIS PROCEEDING?**

7 A. Intervenors have taken issue with the adequacy of Applicant's consideration of impacts
8 arising from the co-location of proposed STP Units 3 & 4 at the site of existing Units 1 &
9 2. In particular, intervenors contend that Applicant has understated the impact of
10 replacement power costs if an accident at one of the units were to cause all four units to
11 shut down. The Board has framed the question as whether "Intervenor's challenges to
12 the replacement power cost estimate are bounded by Applicant's SAMDA analysis." My
13 testimony supports intervenors' position with respect to replacement power costs.

14 **Q. HAVE YOU RELIED UPON ANY ANALYSES PRESENTED BY APPLICANTS?**

15 A. Yes. In response to intervenors' contention regarding replacement power costs,
16 Applicants filed a joint affidavit of Mr. Zimmerly and Mr. Pieniazek ("Affidavit")
17 addressing those issues.¹ In order to more clearly focus the dispute in this proceeding, I
18 have relied on the analyses presented in the Affidavit as a starting point for my analysis.
19 However, my use of the Applicant's Affidavit should not be construed as complete
20 agreement with their analyses.

21 **Q. CAN YOU PROVIDE ADDITIONAL CONTEXT FOR THIS CONTENTION?**
22

¹STNOC's Motion for Summary Disposition of Contention CL-2, Sept. 14, 2010.

1 A. Yes. Subsequent to the submission of contentions and filing of affidavits and reports in
2 this proceeding, a tragic accident occurred at the Fukushima Daiichi reactors in Japan.
3 This accident likely will result in the permanent shutdown of all six nuclear units at the
4 site. The Japanese event raises policy issues regarding the potential risks associated with
5 collocation of multiple nuclear units at a single site. The intervenors in this proceeding
6 request that, as a result of the event which occurred at Fukushima, the Board and
7 Commission apply particular scrutiny to the collocation issue in this proceeding.

8 **II. CRITIQUE OF APPLICANT'S POWER COST ESTIMATES**

9 **Q. DO YOU DISAGREE WITH THE APPLICANT'S TREATMENT OF**
10 **REPLACEMENT POWER COSTS AS SET FORTH IN THE ENVIRONMENTAL**
11 **REPORT'S SAMDA ("SEVERE ACCIDENT MITIGATION DESIGN**
12 **ALTERNATIVES")?**

13 A. Yes. I prepared a preliminary report, filed in support of the contention by Intervenors,
14 which identified a lack of realism in the quantified power cost impacts used in the
15 SAMDA analysis. Applicant's SAMDA analysis presented in Sec. 7.5-S of the
16 environmental report attempted to address the potential impact of a severe accident at
17 Unit 3 or 4 which affects the remaining three South Texas Project (STP) units. In my
18 opinion, the treatment of power cost impacts associated with potential forced outages at
19 STP is both incomplete and unrealistic.

20 **Q. WHAT FACETS OF THE POWER COST IMPACTS SHOULD HAVE BEEN**
21 **ADDRESSED?**

22 A. The impacts include both the cost of power that STPNOC must procure to replace the
23 shut down STP units *and* higher power costs imposed on all consumers in the relevant

1 power market. The former relates to the costs incurred by the STP owners to meet power
2 sales commitments associated with STP generation output. The latter relates to higher
3 costs imposed on the overall market because the STP outages fundamentally change the
4 supply-demand relationship in the energy market.

5 **Q. GENERALLY DESCRIBE THE MAIN FLAW IN THE REPLACEMENT**
6 **POWER COST ESTIMATION IN THE ENVIRONMENTAL REPORT'S**
7 **SECTION 7.5-S.**

8 A. The replacement power costs are based upon a generic estimate derived from modeling of
9 various power pool costs in the 1990's. The underlying framework for the Applicant's
10 analysis will not reflect the changes which have occurred in the electric power industry
11 subsequent to the 1990's. Restructuring of wholesale markets has shifted pricing of
12 power from average cost prices, typical of the regulated utility industry, to market based
13 costs, which in theory are reflective of marginal costs. Restructuring of the electric
14 industry during that time also characterizes the changes which have occurred in Texas.
15 Most customers in the state are no longer served by integrated (bundled) electric utilities,
16 but instead are served at the retail level by deregulated load serving entities which
17 purchase electricity on the wholesale market from unregulated power generation
18 companies. STP is located within the Electric Reliability Council of Texas (ERCOT).

19 **Q. PLEASE DESCRIBE THE RELEVANT CHARACTERISTICS OF ERCOT**
20 **WHICH ARE DISTINGUISHABLE FROM THE ENVIRONMENTAL**
21 **REPORT'S GENERIC ESTIMATION.**

22 A. The use of generic replacement power costs will not reflect the specific characteristics of
23 ERCOT. ERCOT is wholly contained within the state of Texas, and is unlike any other

1 reliability region in the United States because of its limited interconnection. ERCOT is
2 interconnected to other power markets only through limited DC (Direct Current)
3 interchange connections. ERCOT assumes, for reserve margin planning purposes, that
4 only 400 MW of capacity from outside the region are available through these
5 interconnections. Because of ERCOT's isolation and relatively small size, pricing is
6 likely to be more sensitive to significant capacity outages.

7 Customers in ERCOT procure power through bilateral contracts and the ERCOT real
8 time market. Market clearing prices are based on the highest market bid in each real time
9 interval, and bilateral contracts tend to follow the real time market. Gas-fired units are
10 the marginal generation in 90% of annual hours in ERCOT. Prices vary by zone within
11 ERCOT, due to commercially significant transmission constraints. STP is located in the
12 Houston zone and, given the ownership of the units, it is reasonable to assume that STP
13 generation produces power for loads in the Houston and South zones of ERCOT.

14 The environmental report's generic estimation of power costs is based on average
15 embedded costs in the manner typical of fully bundled regulated electric utilities. As an
16 illustration of the difference, suppose that coal fired power output was used to replace
17 part of the shut down STP capacity. In a regulated utility average cost setting, the
18 replacement energy cost is based on coal fired fuel. However, the ERCOT market
19 clearing price for the output of the coal-fired generation usually is based on the energy
20 costs associated with gas-fired generation, which are much higher than coal-fired energy
21 costs, inasmuch as natural gas is a more expensive fuel.

22 **Q. IS IT SUFFICIENT TO REFLECT THE DIFFERENCES IN PRICES BETWEEN**
23 **ERCOT AND A REGULATED UTILITY?**

1 A. No. That is only a starting point for correcting the generic replacement power costs.
2 Except for periods of outage, all STP generation will be bid into the ERCOT market
3 every hour of the year. Removing STP generation will change the marginal units for
4 most time intervals; in essence, removing STP from the bottom of the bid stack will have
5 a domino impact which allows units to set the market price which are less efficient than
6 the units which were on the margin when STP generation was on line. The owners of
7 STP will be forced to buy power to replace the output of the unaffected units (as well as
8 the unit which experienced the accident) in order to meet the requirement of their
9 bilateral contracts and native load. Not only will the ERCOT power be higher cost than
10 the STP variable cost, but the costs of power within ERCOT, at the same time, will rise
11 due to the loss of the STP generation. This means that the replacement power reflects a
12 premium which the STP owners would have to pay above normal ERCOT prices.

13 **Q. DOES THE APPLICANT'S RESPONSE TO YOUR POSITION DISPUTE THAT**
14 **THE ENVIRONMENTAL REPORT'S GENERIC REPLACEMENT POWER**
15 **COST UNDERESTIMATES ERCOT SPECIFIC POWER COSTS?**

16 A. No. In responding to my criticism, the Applicant's Affidavit's indicates that ERCOT
17 power prices are 1.68 to 4 times the SAMDA replacement power cost.² Though the
18 Applicant may not view the difference as material, the Affidavit supports my contention
19 that the environmental report's replacement power quantification is flawed.

20 **Q. ARE OTHER POWER COST IMPACTS ASSOCIATED WITH THE ERCOT**
21 **MARKET IGNORED IN THE APPLICANT'S ENVIRONMENTAL REPORT?**

² Affidavit at 13 – 15.

1 A. Yes. Unlike customers of a traditional regulated utility, prices for customers in ERCOT
2 are subject to price spikes when the market reacts to supply scarcity conditions. The
3 ERCOT market design does not utilize a capacity market, relying upon scarcity pricing in
4 the energy market to compensate generators for capacity costs.

5 **Q. CAN YOU DESCRIBE THE POTENTIAL IMPACTS OF PRICE SPIKES?**

6 A. Yes. An accident and shutdown of all facilities at the STP site is likely to produce price
7 spikes in the ERCOT market. "Price spike" refers to sudden and dramatic increases in
8 real time market prices. The spikes can produce increases many times higher than
9 normal ERCOT prices for individual hours or sustained time intervals. The Public Utility
10 Commission of Texas currently regulates price spikes and places a \$3,000/Mwh cap on
11 competitive bids within ERCOT. Price spikes may occur due to supply shortage
12 conditions or market power. Price spikes tend to be more disruptive than gradual price
13 increases, because market participants have less time to take protective action.

14 Given the fact that STP is expected by market participants to operate in all hours, as well
15 as the large block of capacity represented by the units, the loss of the STP units is likely
16 to exacerbate scarcity conditions during time periods when available reserves are
17 normally tight and increase the number of hours during the year when scarcity conditions
18 exist.

19 The loss of all four STP units simultaneously would represent 43% of the total baseload
20 capacity, and 11% of all installed capacity, in the North and South zones. The lost STP
21 capacity would represent 19% of total ERCOT baseload capacity and approximately 6%
22 of all generation in ERCOT. The Houston/South Texas region would be the most likely
23 to sustain severe price spikes, but the spikes also affect the remainder of ERCOT.

1 The magnitude and frequency of the price spikes could depend on many factors. As an
2 illustration of the impact of price spikes, 62 price spikes in 2008 increased the ERCOT
3 average annual price by 20%.³ Shortage conditions arise when available capacity is
4 inadequate to meet load and ERCOT's operating reserves must be dispatched. In 2008,
5 ERCOT had 103 shortage intervals which produced an average price of \$534/Mwh, or
6 seven times the average real time price, with prices spiking as high as \$2,250/Mwh,⁴
7 which was the bid cap at the time.

8 While price spikes have a direct impact on average ERCOT prices, the spikes can also
9 produce indirect impacts, in terms of economic dislocation, particularly if the spikes
10 become frequent. In the past, severe periods of price spikes have caused bankruptcies of
11 competitive retail electric providers, which exposed affected retail customers to severe
12 price increases. Retail customers, who sign power contracts based upon pricing formulas
13 that are dependent on ERCOT spot prices, can face severe and unexpected monthly price
14 increases, leading to a greater frequency of electric disconnections and financial stress.
15 As time elapses, and the market adjusts to the loss of STP capacity, the probability and
16 severity of price spikes is likely to diminish. However, the time frame of this adjustment
17 is difficult to forecast.

18 **Q. ARE THERE NON-PRICE RELATED RELIABILITY IMPACTS OF A STP**
19 **SHUTDOWN THAT ARE IGNORED IN THE ENVIRONMENTAL REPORT?**

20 **A.** Yes. The simultaneous shut down of a large block of capacity, like the four STP units,
21 increases the risks of grid outages. The event could increase the likelihood of outages on
22 the ERCOT grid which result in load shedding, or even uncontrolled blackouts. Such

³ERCOT State of the Market Report at 7.

⁴Ibidem at 72.

1 outages generally result from a chain of simultaneous events, such as extreme weather,
2 failure of transmission facilities, fuel disruptions, and outages at multiple generating
3 units. The loss of four STP units due to an accident at one of the units is a multiple
4 failure itself. If other conditions or events degrade overall reliability, the STP events
5 could trigger controlled or uncontrolled power outages. Although the probability may
6 not be high, the economic consequences of outages can be extreme. The combination of
7 high prices and rolling blackouts in the 2000/2001 California energy crisis produced
8 economic damage in the range of \$45 billion, accompanied by a slowdown in state
9 economic growth estimated between 0.5% and 1.7%.⁵ The massive Northeast United
10 States blackout of 2003 is estimated to have caused \$10 billion in damage during the
11 course of 1 – 2 days.⁶ These events may represent close to worst case examples, but they
12 illustrate that grid outage costs can produce severe economic damages beyond
13 replacement power costs. Surveys of outage cost indicate that the damage to industrial
14 and commercial customers can be significant, with values as high as \$50,000 - \$1 million
15 per customer for an hour of outage.⁷

16 III. APPLICANTS' REVISED ANALYSIS

17 **Q. DID THE APPLICANT PERFORM AN ANALYSIS TO REVISE THE SAMDA**
18 **RESULTS FOR THE POWER COST ISSUES RAISED IN II. ABOVE?**

19 **A.** Yes. The Applicant's Affidavit prepared further analysis to address the issues described
20 in my preliminary report.

21 **Q. DID THE APPLICANT QUANTIFY THE IMPACT?**

⁵*The California Energy Crisis: Causes and Policy Option*, Christopher Weare, (2003) California Institute of Public Policy.

1 A. Yes. The Affidavit performed analyses to quantify the impact of using ERCOT power
2 prices for replacement power, the market price effect of removing STP from service, the
3 impact of higher market prices on consumers, the potential impact of price spikes arising
4 from the shutdown of STP, and the potential damage of grid outages that could be
5 triggered by a simultaneous forced outage of the four STP units. The Applicant chose to
6 quantify the costs as of 2009.

7 **Q. HOW DID THE APPLICANT COMPARE THE REVISED POWER COSTS TO**
8 **THE LEAST COSTLY SAMDA?**

9 A. The environmental report's SAMDA is based on 1991 dollars. Therefore, the Affidavit
10 inflates the SAMDA costs to make them comparable to 2008 and 2009 dollars. The
11 Affidavit uses the Consumer Price Index-Urban Consumers (CPI-U) to increase the
12 SAMDA by 1.58 for both 2008 and 2009 dollars.

13 **Q. DID THE APPLICANT COMPARE THE COSTS AND BENEFITS AT**
14 **DIFFERENT DISCOUNT RATES?**

15 A. Yes. The Applicant presented results at both a 7% and 3% discount rate, characterizing
16 the latter as a sensitivity test. As I will discuss later in my testimony, I recommend using
17 the 3% discount rate to evaluate the cost effectiveness of the SAMDA. For that reason, I
18 will refer to the cost-effectiveness results based on the 3% discount rate.

19 **Q. WHAT IS THE AFFIDAVIT'S CONCLUSION?**

20 A. Including the revisions for power costs, the Affidavit concludes that the monetized
21 impacts are \$141,200. Because the SAMDA cost is \$158,000 in 2008 or 2009 dollars,

⁶*The Economic Cost of the Blackout, An Issue Paper on the Northeast Blackout, Aug. 14, 2003, ICF Consulting.*

⁷*The Economic Impacts of the August 2003 Blackout, ELCON, Feb. 9, 2004.*

1 the Applicant concludes that the monetized impact, as revised for ERCOT costs, is not
2 sufficient to justify the SAMDA cost.

3 **Q. DO YOU AGREE WITH APPLICANT'S CONCLUSION?**

4 A. No. The SAMDA cost is very sensitive to the inflation measure used to adjust the 1991
5 calculation to 2008 and 2009. I propose an alternative adjustment to SAMDA costs in
6 Sec. IV.

7 **Q. DO YOU AGREE COMPLETELY WITH THE QUANTIFIED REPLACEMENT**
8 **POWER COSTS SET OUT IN THE AFFIDAVIT?**

9 A. Not necessarily. For instance, I have not tested the Applicant's dispatch model for
10 ERCOT, and I do not agree with some of the assumptions used in the model. However,
11 for purposes of this testimony, I have largely accepted the Affidavit's quantification in
12 order to limit the areas of dispute. In addition, the Applicant has taken the position that
13 the Affidavit's quantification is very conservative, implying that the calculations
14 materially overstate replacement power costs. I will discuss my disagreement with that
15 position later in my testimony.

16 **Q. HAVE RECENT EVENTS RAISED ANY QUESTIONS IN YOUR MIND ABOUT**
17 **THE ASSUMED DURATION OF REQUIRED REPLACEMENT POWER?**

18 A. Yes. In my preliminary report, I did not contest the Applicant's assumption that an
19 accident in one of the ABWR units would shut down Units 1 and 2 for two years and the
20 companion ABWR unit for six years. At the time, the six year shut down of Three Mile
21 Island Unit 1, caused by the accident at Three Mile Island Unit 2, was the primary point
22 of reference. However, the accident at Fukushima Daiichi in Japan provides a new

1 reference point whereby accident damage to three units will likely result in the permanent
2 shutdown of all six units. Although the relevant lessons from the Japanese accident may
3 not be fully known yet, a longer duration shut down of STP Units 1 and 2 is a plausible
4 scenario that should be considered for replacement power costs. For example, an
5 assumed six year forced outage at STP Units 1 and 2 would significantly increase
6 replacement power costs. Although I have not incorporated this possibility into my
7 calculations, a longer duration shut down period could increase the replacement power
8 costs by 50% or more.

9 IV. INFLATION INDICES

10 **Q. WHAT ALTERNATIVES DID YOU CONSIDER TO THE APPLICANTS' USE**
11 **OF CPI-U TO ADJUST SAMDA FOR INFLATION?**

12 The CPI is not the only available measure of inflation, nor is it necessarily the best
13 measure. A weakness of the CPI is that it is based on fixed proportions of expenditure
14 components and does not account for households' ability to change those proportions
15 over time in response to price or other factors. Another weakness of the CPI is its
16 sensitivity to volatile price components like energy and food. The sensitivity of the
17 SAMDA cost to escalation rates can be shown by alternative inflation indices which
18 arguably provide a more appropriate estimate of price changes. The Gross Domestic
19 Product Implicit Price Deflator (GDP-IPD)⁸ is used to convert nominal costs to real costs
20 based on the overall domestic economy. This index would result in a SAMDA of
21 \$144,000 and \$145,000 in 2008 and 2009 dollars, respectively. The United States Office
22 of Management and Budget recommends the use of the GDP-IPD when a general

inflation rate is required.⁹ The Personal Consumption Expenditures (PCE) price index¹⁰ measures consumer price inflation based on domestic personal consumption, and is used by the Federal Reserve's Federal Open Market Committee to measure inflation. The PCE results in a SAMDA of \$144,000 in 2009 dollars. The Core PCE¹¹ excludes volatile components and results in a SAMDA of \$141,300 and \$143,700 in 2008 and 2009 dollars, respectively. The Core PCE is selected as a more accurate measure of the long term inflation trend.

Q. CAN YOU CITE EVIDENCE WHICH SUPPORTS USING THE PCE AND CORE PCE?

A. Yes. The Federal Reserve's Board of Governors relies on both the PCE and PCE Core. When it replaced the CPI with the PCE as a principal measure of inflation, the Federal Reserve's Monetary Policy Report to Congress included the following explanation:

The chain-type price index for PCE draws extensively on data from the consumer price index but, while not entirely free of measurement problems, has several advantages relative to the CPI. The PCE chain-type index is constructed from a formula that reflects the changing composition of spending and thereby avoids some of the upward bias associated with the fixed-weight nature of the CPI. In addition, the weights are based on a more comprehensive measure of expenditures. Finally, historical data used in the PCE price index can be revised to account for newly available information and for improvements in measurement techniques, including those that affect source data from the CPI; the result is a more consistent series over time.¹²

The basis for using core PCE (excluding energy and food) has been explained by the Federal Reserve Bank of San Francisco:

⁸ The GNP-IPD is shown at: <http://research.stlouisfed.org/fred2/data/GNPDEF.txt>

⁹ See, 7(b) of OMB Circular A-94. http://www.whitehouse.gov/omb/circulars_a094#7

¹⁰ Title: Personal Consumption Expenditure Chain Type Price Index (PCEPI), U.S. Department of Commerce, Bureau of Economic Analysis.

1 *One common way economists use inflation data is by looking at “core*
2 *inflation,” which is generally defined as a chosen measure of inflation*
3 *(e.g., the Consumer Price Index or CPI, the Personal Consumption*
4 *Expenditures Price Index or PCEPI, or the Gross Domestic Product*
5 *Deflator) that excludes the more volatile categories of food and energy*
6 *prices... To understand why the categories of food and energy are more*
7 *sensitive to price changes, consider environmental factors that can ravage*
8 *a year’s crops, or fluctuations in the oil supply from the OPEC cartel.*
9 *Each is an example of a supply shock that may affect the prices for that*
10 *product. However, although the prices of those goods may frequently*
11 *increase or decrease at rapid rates, the price disturbances may not be*
12 *related to a trend change in the economy’s overall price level. Instead,*
13 *changes in food and energy prices often are more likely related to*
14 *temporary factors that may reverse themselves.*¹³

15 **Q. DO YOU PROPOSE ADDITIONAL ADJUSTMENTS IN ORDER TO COMPARE**
16 **THE SAMDA COST WITH 2008 OR 2009 REPLACEMENT POWER COSTS?**

17 **A.** Yes. Prices and price changes vary by location and region of the country. The revised
18 replacement power costs represent ERCOT specific costs rather than generic power costs.
19 For that reason, it is appropriate to compare those costs to SAMDA costs which are
20 location specific rather than generic. The cost of living in Southern cities generally is
21 lower than prices based on a national average. The Houston area is reasonably close to
22 Bay City and provides a reasonable benchmark for the cost of living differential
23 compared to the national average. The cost of living index for Houston-Sugarland-
24 Baytown is 90.7 (National Average=100).¹⁴ Recognizing the regional differences in
25 price levels and inflation is an accepted method of improving the accuracy of price
26 adjustments. For example, the Handy-Whitman Index of utility construction costs, which

¹¹PCE Less Food & Energy Chain Price, *ibidem*.

¹²Federal Reserve Board Report to Congress, Feb. 17, 2000, footnote 1.

¹³Federal Reserve Bank of San Francisco, October 2004.

¹⁴ACCR Cost of Living Index, Year End 2008 Review.

1 is widely used for trending utility costs, provides price levels for six regions of the United
2 States.¹⁵

3 **Q. HOW DOES THE HOUSTON COST OF LIVING ADJUSTMENT AFFECT THE**
4 **SAMDA?**

5 A. The range of 2008 or 2009 costs for the SAMDA threshold using the three price indices
6 described above is \$141,300 - \$145,000. Applying a 90.7% cost of living adjustment for
7 the Houston area, the range is reduced to \$128,159 - \$131,515. The revised impacts set
8 out in paragraph 74 of the Affidavit are \$141,211, and thereby exceed the adjusted
9 SAMDA threshold.

10 **Q. WHAT IS YOUR CONCLUSION?**

11 A. I do not agree with the Applicant's conclusion that the revised ERCOT power cost
12 impacts show that there are no cost effective SAMDAs.

13 **V. DISCOUNT RATE**

14 **Q. PLEASE DISCUSS YOUR POSITION WITH RESPECT TO THE APPLICATION**
15 **OF A DISCOUNT RATE TO THE REPLACEMENT COSTS?**

16 A. The Applicant provides results based on both a 3% and 7% discount rate. My position is
17 that the 3% discount rate analyses are appropriate and in the public interest; the lower
18 discount rate is consistent with societal interest in mitigating damage from the project.

19 **Q. IS A 3% DISCOUNT RATE REASONABLE?**

20 A. Yes. Use of a 3% discount rate is reasonable, and should not be viewed as exceeding
21 normal standards for cost benefit analyses. The societal time preference should reflect

¹⁵ For example, the 2008 Handy Whitman Index for steam and nuclear construction costs in the South Central

1 long term impacts of public projects. Long term returns for treasury bills of 3% – 4% are
2 often used as a measure of the appropriate discount rate. Although the United States
3 Office of Management and Budget (OMB) indicates that 7% is the default discount rate
4 for cost-benefit analyses, OMB specifies discount rates for cost-effectiveness analyses,
5 based on treasury bills of 10, 20, and 30 years as follows: (nominal) 10 year- 3.9%; 20
6 years- 4.4%; 30 years- 4.5%; (real) 10 year- 2.2%; 20 year- 2.7%; 30 year- 2.7%.¹⁶
7 These values are broadly consistent with the constant dollar comparison of SAMDA with
8 monetized impacts using a discount rate in the 3% range. Moreover, the discount rates
9 are applicable to a cost effectiveness analysis, and the SAMDA comparison should be
10 considered a cost-effectiveness test.

11 **Q. ARE YOU AWARE OF ANY SPECIFIC CIRCUMSTANCES THAT SUPPORT**
12 **THE USE OF A LOWER DISCOUNT RATE SUCH AS 3%?**

13 **A.** Yes. The owners of this project anticipate financing the project with federal loan
14 guarantees. NRG has indicated that it will continue to pursue federal loan guarantees for
15 STP Units 3 and 4, which is among the finalists for United States Department of Energy
16 financial guarantees. The loan guarantees are intended to significantly reduce financing
17 costs, by providing lower interest rates and decreasing the owner's equity contribution to
18 the project. Thus, a discount rate below the normal interest rates for corporate borrowing
19 is appropriate. Because the U.S. Treasury will guarantee the payment of interest to
20 creditors, a discount rate consistent with the historical yields on treasury bills is
21 reasonable.

United States is 96% of the average for all six regions.

¹⁶http://www.whitehouse.gov/omb/circulars_a094_a94_appx-c/

1 **VI. CLAIMS OF “CONSERVATISM”**

2 **Q. APPLICANT’S AFFIDAVIT CLAIMS THAT ITS ANALYSIS IS VERY**
3 **CONSERVATIVE. DO YOU AGREE?**

4 **A.** No. In my opinion, the Applicant has exaggerated these claims by failing to recognize
5 assumptions in its analysis that offset the claimed conservatism of certain aspects of its
6 analysis, as well as overstating the evidence that the analyses are conservative.

7 **Q. THE AFFIDAVIT COMPARES THE 2008 ERCOT PRICES USED IN ITS**
8 **CALCUATION TO THE LOWER 2009 ERCOT PRICES. DOES THIS**
9 **COMPARISON DEMONSTRATE THAT THE 2008 ERCOT PRICES IN THE**
10 **ANALYSIS ARE TOO HIGH?**

11 **A.** No. 2009 ERCOT market prices are not a representative benchmark. The 2009 prices
12 represent the depths of a major national recession and the resulting collapse of natural gas
13 prices. The 2009 gas prices at the Henry Hub¹⁷ were at the lowest level since 2001. By
14 2010, ERCOT market prices began to rebound as the economy started the process of
15 economic recovery. The Affidavit describes 2008 ERCOT prices as if it reflects an
16 extreme aberration. Average ERCOT prices in 2008 (\$77.19) were only 6% higher than
17 average prices three years earlier (2005--\$72.79). The ERCOT 2008 State of the Market
18 Report states, “the movement in wholesale energy prices from 2007 to 2009 were largely
19 a function of natural gas price levels.”¹⁸ Even if one accepts the characterization of 2008
20 ERCOT pricing as above average for recent years, this does not mean that use of 2008
21 ERCOT prices is excessive within the context of the Applicant’s analysis. The Affidavit

¹⁷Henry Hub is a gas pipeline interconnection in Louisiana that is the primary pricing point for natural gas prices in North America. NYMEX natural gas futures contracts are based upon Henry Hub prices.

¹⁸ERCOT SOM Report 2008 at iii.

(Paragraph 33) asserts that “current or historical” power pricing data should be used “rather than attempt to forecast future energy prices throughout the life of the STP units” in order to remove “speculation” from the analysis. Most, if not all, natural gas price forecasts expect real price escalation (i.e., gas price increases in excess of the general inflation rate) over the long term horizon. Since ERCOT power prices are strongly influenced by natural gas prices, a reasonable inference is that ERCOT wholesale power prices are likely to increase at a rate higher than inflation. The use of a historical period gas price ignores real escalation that will affect fuel prices when the STP Units 3 and 4 are operational. Given the implicit assumption made by STPNOC that future natural gas prices will increase at the rate of inflation, utilizing a “current” period which reflects the high end of recent natural gas prices is not unreasonable.

Q. APPLICANT’S AFFIDAVIT (PARAGRAPH 44) REFERENCES THE ERCOT 12.5% RESERVE MARGIN AS EVIDENCE THAT THE REPLACEMENT POWER COSTS, PRICE SPIKES, AND GRID OUTAGES CALCULATIONS ARE CONSERVATIVE. ARE YOU PERSUADED?

A. No. The installed reserve margin requirement only indicates that sufficient physical capacity is available to meet ERCOT’s reliability objectives. The existence of physical installed capacity does not mean that the capacity is available at the time that an accident occurs at STP. Operating reserves are a more relevant measure of available reserves when a forced outage occurs at STP. Responsive reserves are the operating reserves which are on line and immediately available to replace units which are forced off line. The minimum responsive reserve requirement in ERCOT is 2,300 MWs. The four STP units constitute 5,260 MW which exceeds the minimum responsive reserves.

1 **Q. THE AFFIDAVIT STATES THAT NEW COMBUSTION TURBINE CAPACITY**
2 **CAN BE INSTALLED WITHIN ONE YEAR TO REPLACE THE LOST STP**
3 **CAPACITY. IS THIS CLAIM REASONABLE?**

4 **A.** This claim appears to be overly optimistic. The U.S. Energy Information Administration
5 lists 2 years as the lead time for combustion turbine capacity.¹⁹ Moreover, the actual
6 construction lead time is not the only time duration issue. ERCOT cannot order market
7 participants to build capacity. The market participants make those decisions based on
8 their own financial and corporate circumstances. Corporate decision making processes
9 require time, and the transactions usually require evaluations and decisions by creditors
10 and lenders, as well. Prior to committing to investments that may be in the range of
11 hundreds of million dollars, generators may remain cautious in order to determine
12 whether the high energy prices are persistent. Depending on market conditions, it is also
13 possible that vendor backlogs can slow down the acquisition of combustion turbine
14 capacity.

15 **Q. IS THE APPLICANTS' DISPATCH STUDY CONSERVATIVE?**

16 **A.** Based on the description, the model reflects several assumptions that may tend to
17 understate the impact of an STP shut down on ERCOT market prices. The Affidavit
18 describes (Paragraphs 48 – 53) a dispatch model used to simulate ERCOT prices. The
19 realism of this model cannot be tested without a review of the model and software.
20 However, based on the description, some of the assumptions are questionable. The
21 model assumes that wind generation, which is substantial in Texas, will have a capacity
22 factor of 24.5%. However, wind generation capability is not spread equally across hours

¹⁹http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/electricity_tbls.pdf (See Table 8.2)

1 of the day or hours of the year. Wind power output tends to be highest at night and
2 during non-summer periods. For annual reserve margin calculations, ERCOT assumes
3 that 9% of wind capability is available. During some time periods, the wind generation
4 cannot be delivered and ERCOT pays the generators to back down. The model's
5 treatment of ancillary services appears simplistic, since ancillary service pricing would be
6 directly affected by significant outage events, such as the loss of STP generating units.
7 Finally, the model sets all hourly prices equal to marginal costs, which assumes perfect
8 competition. A generator is unlikely to bid exactly at its marginal cost, because the
9 generator expects to earn at least a small margin above its variable cost as profit. And
10 under certain market conditions, the generator may realize that a bid substantially above
11 marginal cost will be accepted. In reality, competitive power markets are susceptible to
12 market power, because one or more suppliers will be pivotal in certain hours. The
13 assumption that no market power will affect power prices is unrealistic.

14 **Q. THE AFFIDAVIT CLAIMS THAT THE TRANSITION TO A NODAL MARKET**
15 **WILL REDUCE PRICE SPIKES IN ERCOT. IS THIS RELEVANT TO THE**
16 **ISSUE IN THIS CASE?**

17 **A.** No. Even if true, the nodal market will only reduce price spikes associated with
18 transmission constraints. This issue in this case involves generation scarcity caused by a
19 forced outage at STP. Nodal pricing is intended to reflect locational market pricing in
20 order to provide appropriate price signals to generators. This could result in higher prices
21 paid to generators in some areas.

22 **Q. DOES THIS CONCLUDE YOUR TESTIMONY AT THIS TIME?**

23 **A.** Yes.

Affidavit

My name is Clarence L. Johnson and I am a resident of the City of Austin, County of Travis, Texas. I hereby declare, under penalty of perjury, that: (1) I am responsible for the pre-filed Direct Testimony of Clarence Johnson, filed in Docket Nos. 52-012 and 52-013 (COL) before the Atomic Safety & Licensing Board, and attached hereto; and (2) The contents of the testimony are true and correct to the best of my knowledge and belief.

A handwritten signature in black ink, appearing to read "Clarence Johnson", with a stylized, cursive script.

Clarence Johnson

Dated: May 9, 2011