BEFORE THE ARKANSAS PUBLIC SERVICE COMMISSION

IN THE MATTER OF THE APPLICATION OF ENTERGY ARKANSAS, INC. FOR APPROVAL OF CHANGES IN RATES FOR RETAIL ELECTRIC SERVICE	))))	Docket 06-101-U

SURREBUTTAL EXHIBITS OF WILLIAM B. MARCUS

on behalf of

THE ATTORNEY GENERAL

March 26, 2007

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List of Exhibits

WBM-SR-1 **Lawrence Kryzanowski and Gordon Roberts, "Should the Arithmetic or Geometric Mean Be Used to Estimate Implied Risk Premia Using Historical Realized Returns," September 2003.**

WBM-SR-2 **EAI Avoided Cost Filings Effective July 1, 1990 and January 1, 2007**

WBM-SR-3 **Press Releases Regarding Entergy's Commitment to Cap and Reduce Greenhouse Gas Emissions**

WBM-SR-4 (HSPI) **Data on Seasonality of Marginal Capacity Costs, Average Market Prices, Gas Prices, and Implicit Heat Rates from AG DR 2-2 (HSPI) NOT INCLUDED WITH PUBLIC FILING**

WBM-SR-1 **Lawrence Kryzanowski and Gordon Roberts, "Should the Arithmetic or Geometric Mean Be Used to Estimate Implied Risk Premia Using Historical Realized Returns," September 2003.**

Generic Cost of Capital Proceeding
Proceeding No. 1271597

Prepared Testimony

On Capital Structure, Fair Return on Equity and Annual Adjustment Mechanism

of

Dr. Lawrence Kryzanowski and Dr. Gordon S. Roberts

On Behalf of the Consumers Group

Ned Goodman Chair in Investment Finance, John Molson School of Business, Concordia University, Montreal, Canada; and CIBC Professor of Financial Services and Area Coordinator, Schulich School of Business, York University, Toronto, Canada.

September 12, 2003

APPENDIX 4.A

SHOULD THE ARITHMETIC OR GEOMETRIC MEAN BE USED TO ESTIMATE IMPLIED RISK PREMIA USING HISTORICAL REALIZED RETURNS?

1. The Choice:

It is preferable to use the geometric average (mean) historical risk premium when measuring historical holding period performance. The reason is that the geometric mean exactly represents the constant rate of return that is needed in each year to exactly match actual performance over that past investment period.[1] This is the reason why Canadian mutual funds are required to disclose compound rates of return, which is just a different name for a geometric mean return. Similarly, the annual yield-to-maturity quoted on a long-term bond is an annual geometric return.

It is preferable to use the arithmetic mean historical market risk premium when making investment decisions for a one-period investment horizon when the investment horizon is identical to the interval of time over which the historical returns are measured. The reason is that the arithmetic mean is an unbiased estimate of an investment's expected future risk premium for a single period investment horizon. Thus, if historical market equity risk premia are measured using annual returns, then the future investment horizon should be one year.

The arithmetic mean also is preferred when historical returns are normal IID or independently and identically distributed over the estimation period. This is the assumption implicitly invoked by the advocates of the use of the arithmetic average, such as Drs. Brealey and Myers, and Drs. Dimson, Marsh and Staunton (2003), and

[1] The superiority of the geometric mean over the arithmetic mean is easily shown using an example drawn from L. Kryzanowski, *Investment and Portfolio Management* (Montreal: Institute of Canadian Bankers, 1996), p. 82. The example concerns the investment portfolio of Mr. John Velco whose investment portfolio increases from $200,000 to $400,000 during the first year for an annual return of 100%, and then returns to its original $200,000 value during the second year for an annual return of –50%. The arithmetic and geometric mean annual returns are 25% and 0%. Of course, the correct constant annual return has to be 0% since the beginning and ending portfolio values are identical.

others, when they recommend the use of the arithmetic mean of historical premiums as the looking-forward expected equity risk premium.[2] Unfortunately, the normal IID assumption is not appropriate for asset returns over long estimation periods. This assumption suffers from various important drawbacks. First, even if single-period returns are assumed to be normal, then multiperiod returns cannot also be normal since they are products (not sums) of the single-period returns. Second, several studies using longer-horizon or multi-year returns conclude that there is substantial mean-reversion (i.e., negative serial correlation) in stock market prices at longer horizons.[3] Third, the plausibility of the assumption that returns are IID diminishes as the estimation time period gets longer. Drs. Campbell, Lo and MacKinlay state this as follows:[4]

> "...the assumption of identically distributed increments is not plausible for financial asset prices over long time spans. For example, over the two-hundred-year history of the New York Stock Exchange, there have been countless changes in the economic, social, technological, institutional, and regulatory environment in which stock prices are determined. The assertion that the probability law of daily stock returns has remained the same over this two-hundred period is simple implausible."

The geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when returns are not normal IID due to, for example, long-run mean reversion in some asset returns (as has been found for stocks) and in market equity risk premia, and mean aversion in others (as has been found for bonds). Dr. Siegel notes that his work on the risk premium using data for the period 1802-2001 provides support for mean reversion for a 30-year horizon (i.e., the horizon used for Long Canada's in rate of return regulation).[5] We provide further empirical support for mean reversion in both Canadian and American equity risk premia in section IV of our evidence.

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[2] Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, forthcoming *Journal of Applied Corporate Finance* 15:4 (Summer 2003), p. 15.
[3] For examples, see E. Fama and K. French, 1988, Permanent and Temporary Components of Stock Prices, *Journal of Political Economy* 96, pp. 246-273; and J. Poterba and L. Summers, 1986, Mean reversion in stock returns: Evidence and implications, *Journal of Financial Economics* 22, pp. 27-60.
[4] John Y. Campbell, Andrew W. Lo and A. Craig MacKinlay, 1997, *The Econometrics of Financial Markets* (Princeton, New Jersey: Princeton University Press), pp. 32-33.
[5] Jeremy J. Siegel, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 46.

Dr. John Campbell at a recent *Equity Risk Forum* has aptly stated this argument as follows:[6]

> "Which is the right concept, arithmetic or geometric? Well, if you believe that the world is identically and independently distributed and that returns are drawn from the same distribution every period, the theoretically correct answer is that you should use the arithmetic average. Even if you're interested in a long-term forecast, take the arithmetic average and compound it over the appropriate horizon. However, if you think the world isn't i.i.d., the arithmetic average may not be the right answer.
>
> I think that the world has some mean reversion. It isn't as extreme as in the highway example, but whenever any mean reversion is observed, using the arithmetic average makes you too optimistic. Thus, a measure somewhere between the geometric and the arithmetic averages would be the appropriate measure."

Similarly, Dr. Damordaran, author of numerous books on valuation, states:[7]

> "The conventional wisdom is that the arithmetic mean is the better estimate. This is true if
> (1) you consider each year to be a period (and the CAPM to be a one-period model)
> (2) annual returns in the stock and bond markets are serially uncorrelated
> As we move to longer time horizons, and as returns become more serially correlated (and empirical evidence suggests that they are), it is far better to use the geometric risk premium. In particular, when we use the risk premium to estimate the cost of equity to discount a cash flow in ten years, the single period in the CAPM is really ten years, and the appropriate returns are defined in geometric terms.

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[6] John Campbell, Historical results: Discussion, Equity Risk Premium Forum, November 8, 2001, p. 45.
[7] Aswath Damodaran, Discussion issues and derivatives, found on his website at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/AppldCF/derivn/ch4derjv.html#ch4.3.

In summary, the arithmetic mean is more appropriate to use if you are using the Treasury bill rate as your riskfree rate, have a short time horizon and want to estimate expected returns over that horizon.
The geometric mean is more appropriate if you are using the Treasury bond rate as your risk free rate, have a long time horizon and want to estimate the expected return over that long time horizon."

Dr. Jay Ritter in his keynote address at the 2001 meetings of the Southern Finance Association states that "with mean reversion, the multiperiod arithmetic return will be closer to the geometric return".[8] He notes that stock returns show a tendency towards mean reversion and bond returns show a tendency towards mean aversion in the U.S. In turn, based on the standard deviations of returns for data starting in 1802 (the Siegel data set), he shows that stocks are twice as risky as bonds for one-year holding periods, and stocks are less risky than bonds for holding periods of twenty or more years.

The use of the geometric mean is supported empirically. Fama and French estimate the nominal cost of capital for U.S. nonfinancial corporations for 1950-1996 as 10.72%. Since this is smaller than the nominal return on investment of 12.11%, average corporate investment has been profitable.[9] If the arithmetic mean of the simple annual returns is used instead to obtain an estimate of the nominal cost of capital, the resulting value of 12.12% is about the same as the return of investment of 12.11%. This implies that average investment by corporate U.S. has added no value over the 1950-1996 period, which seems unreasonable to Fama and French and ourselves given stock market performance over this period of time. Thus, Fama and French conclude that the

[8] Jay R. Ritter, The biggest mistakes we teach, *The Journal of Financial Research* 25:2, Summer 2002, pp. 159-168.
[9] These two values are the IRRs on value and on cost, respectively. The geometric mean of simple annual returns on cost is almost identical. Eugene F. Fama and Kenneth R. French, 1999, The corporate cost of capital and the return on corporate investment, *The Journal of Finance* December, pp. 1939-1967. As in Copeland et al. (1990), the return on value is an estimate of the cost of capital when the cost of capital is taken to be an expected compound return. Tom Copeland, Tim Koller and Jack Murrin, 1990, *Valuation in measuring and managing the value of companies* (John Wiley and Sons, New York).

geometric mean estimate of the cost of capital is more consistent with the data than the arithmetic mean estimate of the cost of capital over this period of time.

The expected one-period simple return (i.e., the arithmetic mean of the one-period simple return) is only an appropriate return concept for the cost of equity capital for a short future time horizon of one period (usually a year).[10] For multiple-period horizons, expected return estimates enter the present value expressions in a nonlinear manner. Thus, numerous articles have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia.

Other studies have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia, without any reference to mean-reversion.

The first group of studies that examine which type of mean is appropriate for long horizon decision-making examines the biases caused by the fact that discount factors involve powers of the reciprocal of the rate of return. Blume (1974) and Indro and Lee (1997) show mathematically that for long-run expected returns and risk premia, the arithmetic average produces an estimate that is upwardly biased, and that the geometric average produces an estimate that is downwardly biased.[11] The simulation results of Indro and Lee (1997) support the use of a horizon-weighted average of the arithmetic and geometric averages proposed by Blume (1974). In the Blume average, the arithmetic average receives all the weight when the time horizon or project life (denoted by N) is one period, and the geometric average receives all the weight when the time horizon is equal to the number of time periods (denoted by T) used to obtain a historical estimate of average returns or risk premia.

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[10] Eugene F. Fama, 1996, Discounting under uncertainty, *Journal of Business* 69, pp. 415-428.
[11] M.E. Blume, Unbiased estimators of long-run expected rates of return, *Journal of the American Statistical Association* 69:347 (September 1974), pp. 634-638; and D.C. Indro and W.Y. Lee, Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia, *Financial Management* 26:4 (Winter 1997), pp. 81-90.

To illustrate, if we deem that 30 years constitutes the long-run as is assumed for the cost of debt and we use the longest available time period without serious measurement errors to estimate the market risk premium in Canada (namely, the 45 year period, 1957-2001), the weight placed on the geometric average, w_G, is:

$$w_G = (N - 1) / (T - 1) = (30 - 1) / (45 - 1) = 29 / 44 = .66 \text{ or } 66\%.$$

Similarly, if we use the longest available time period for which we have data in Canada to estimate the market risk premium (namely, the 78 year period, 1924—2001), the weight placed on the geometric average, w_G, is:

$$w_G = (N - 1) / (T - 1) = (30 - 1) / (78 - 1) = 29 / 77 = .38 \text{ or } 38\%.$$

Of course, the long run is longer than 30 years, and we would use it for bonds if such maturities were available.

The second group of studies that examine which type of mean is appropriate for long horizon decision-making assesses the effect of estimation errors when the estimate is used for multi-period forecasting or decision-making. Drs. Jacquier, Kane and Marcus show that the use of the sample arithmetic mean produces an upward-biased forecast, and that this bias does not disappear, even if the sample mean is computed using long data series and returns come from a stable distribution with no serial correlation.[12] They show that, while a weighted-average of the arithmetic and geometric average returns provides an unbiased estimate of long-term returns, the best estimate of cumulative returns is even lower. They conclude that this "further compounds the recent sobering message in Fama-French (2002) and Jagannathan et al. (2000) who suggest that the equity risk premium is lower than once thought". They further conclude that:

> "Strong cases are made in recent studies that the estimate of the market risk premium should be revised downward. Our result compounds this argument by stating that even these lower estimates of mean return should be adjusted further downward when predicting long-term cumulative returns."

[12] Eric Jacquier, Alex Kane and Alan J. Marcus, 2003, Optimal forecasts of long-term returns: Geometric, arithmetic, or other means?, *Financial Analysts Journal* (forthcoming August).

Thus, until the issue is resolved, a weighted-average of the arithmetic and geometric means is best. To err on the side of being conservative, a weighted average that places an equal or greater weight on the arithmetic mean appears to be most reasonable.

2. The Choice and Financial Integrity:

Although we do not believe that any additional return needs to be added to ensure the financial integrity of a utility, the use of a weighted average of the geometric and arithmetic mean historical market risk premia does provide some unspecified premium to that effect because the chosen weighted average is still likely to be optimistic.

A further benefit of using a weighted average, or what equivalently is equal to adding the weight placed on the arithmetic mean multiplied by the difference in the two averages to the geometric mean, is that it provides a premium that increases or decreases with the level of investment risk as measured by the standard deviation of the market. When the market has no risk, the two means are identical. Thus, for the extreme case of no market risk, the use of the weighted average instead of the annual geometric market risk premium provides no extra risk premium that will ensure financial integrity, as none is needed. When market risk is present, the weight placed on the arithmetic mean multiplied by the positive numerical difference between the arithmetic mean market risk premium and the geometric mean market risk premium grows with higher levels of risk. Thus, the use of the annual geometric mean market risk premium plus the weight placed on the arithmetic mean multiplied by the difference between the annual arithmetic and geometric mean market risk premia provides more risk premium coverage for ensuring financial integrity for greater levels of market risk.

This is best illustrated by referring to the example in Schedule 4.A1. In this example, we show what happens to the final wealth position of two typical investors who each invest $6,592.58 in two different utilities at the end of 1989. For ease of presentation, we assume that each utility is well diversified and has the same investment risk and return as the market. The first investor invests in the first utility whose value compounds

at the annual geometric mean return for the S&P/TSX Composite over the ten-year period 1990-1999. As expected, the terminal value of the investment in the first utility by the first investor is equal to the ending value of $17,960.99 for the S&P/TSX Composite index for 1999. Thus, the first investor receives the same return as given by the market on his utility investment. In contrast, the second investor invests in the second utility whose value compounds at the annual arithmetic mean return for the S&P/TSX Composite over the ten-year period 1990-1999. As expected, the terminal value of the investment in the second utility by the second investor of $19,759.06 is now greater than the terminal value of $17,960.99 for the S&P/TSX Composite index at year-end 1999. Thus, this second investor has achieved what finance professionals refer to as an abnormal return or "free lunch", and investment professionals refer to as a positive alpha. In fact, the second investor has achieved an above market return per dollar of initial investment without incurring any additional risk when performance is benchmarked against the performance of the market.

From the perspective of the second utility, the difference between the annual geometric and arithmetic mean returns of approximately 106 basis points represents the amount of return that it can forego before it begins to disappoint its equity investors. In a rating setting forum, the full 106 basis points would represent a very expensive insurance premium to pay annually to ensure that a utility is guaranteed financial integrity.

Schedule 4.A1

This table contains a comparison of the wealth implications for equity investors of using arithmetic versus geometric mean returns based on an assumed investment of $6592.58 by two different investors in two different utilities. For ease of exposition, the two utilities are assumed to have the same investment risk as the market (i.e. their betas are one) and to be well diversified.

Year end	For the total return S&P/TSX Composite index:			Portfolio value when promised annual return is:	
	Index value	Annual return	Annual return relative	Geometric mean	Arithmetic mean
1989	6592.58			6592.58	6592.58
1990	5617.01	-0.14798	0.85202	7287.57	7357.44
1991	6291.90	0.120151	1.120151	8055.83	8211.03
1992	6201.72	-0.014333	0.985667	8905.08	9163.65
1993	8220.23	0.325476	1.325476	9843.86	10226.80
1994	8205.73	-0.001764	0.998236	10881.60	11413.29
1995	9397.97	0.145294	1.145294	12028.75	12737.43
1996	12061.95	0.283463	1.283463	13296.82	14215.20
1997	13868.54	0.149776	1.149776	14698.58	15864.41
1998	13648.84	-0.015842	0.984158	16248.11	17704.97
1999	17960.99	0.315935	1.315935	17960.99	19759.06

The annual arithmetic and geometric mean returns are 0.116018 and 0.10542, respectively.

WBM-SR-2 EAI Avoided Cost Filings Effective July 1, 1990 and January 1, 2007

AP&L

Arkansas Power & Light Company
425 West Capitol
P. O. Box 551
Little Rock, AR 72203
Tel 501 377 4000

FILED

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June 1, 1990

ARK. PUB. SERV. COMM.
SECRETARY OF COMMISSION

Ms. Jan Sanders, Secretary
Arkansas Public Service Commission
P.O. Box C-400
Little Rock, Arkansas 72203

Re: Arkansas Power & Light Company
Avoided Capacity & Energy Costs
Docket No. 81-071-F

Dear Commissioners;

Attached is Arkansas Power & Light Company's Avoided Capacity & Energy Costs Bulletin No. 20 containing the avoided capacity and energy costs to be applied under Rate Schedule Rider M23. It is intended that these costs would become effective July 1, 1990 and would be updated no later than 6 months from this date.

If you need further information, please let me know.

Sincerely,

Jim Gammon, Executive Director
Market & Regulatory Planning

Drr:drr

Attachment

cc: Ms. Diana Brenske

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ARKANSAS POWER & LIGHT COMPANY
AVOIDED CAPACITY AND ENERGY COSTS
APPLICABLE TO RIDER M23
- ARKANSAS -

AVOIDED CAPACITY COSTS:

Capacity - $0.0 per Kw of capacity under a long term contract subject to approval of the Arkansas Public Service Commission.

AVOIDED ENERGY COSTS:

	Summer Period*		Other Period		Annual
Voltage Level of Purchase	On-Peak	Off-peak	On-peak	Off-Peak	Average
Generation - Cents/Kwh	2.160	1.785	1.938	1.699	1.807
Transmission - Cents/Kwh	2.237	1.837	1.988	1.738	1.855
Primary - Cents/Kwh	2.295	1.878	2.030	1.771	1.894
Secondary - Cents/Kwh	2.369	1.947	2.104	1.845	1.967

ON-PEAK/OFF-PEAK HOURS

On-Peak Hours	1:00 p.m. - 8:00 p.m. Monday - Friday	7:00 a.m. - 6:00 p.m. Monday - Friday
Off-Peak Hours	All hours not desiginated as on-peak hours.	

* Summer Period: The Summer Period is defined as the billing months of June, July, August, and September. All other billing months are defined as Other Period.

NOTES:

(1) The avoided energy costs in this Bulletin were developed to be applicable to total energy of 100 Mwh per hour.

(2) The avoided energy costs in this Bulletin are adjusted to reflect the various losses appropriate to the voltage level at which purchases are made. The voltage level descriptions are Generation (0% Losses); Transmission - 115,000 volts or higher; Secondary - lower than 12,500y/7,200 volts; and Primary - all voltages between Transmission and Secondary.

(3) This Bulletin is applicable in the AP&L load control area only.

(4) Average annual numbers are shown for informational purposes and may be used for purchases from small qualified facilities if time of use metering is not economical.

Avoided Costs Bulletin No. 20
Effective July 1, 1990
Market & Regulatory Planning Department
Little Rock, Arkansas

Entergy

Entergy Arkansas, Inc.
Regulatory Affairs
425 West Capitol Avenue
P. O. Box 551
Little Rock, AR 72203-0551
Tel 501 377 4000

December 21, 2006

Ms. Diana Wilson, Secretary
Arkansas Public Service Commission
P. O. Box 400
1000 Center Street
Little Rock, AR 72203

Re: Entergy Arkansas, Inc.
Avoided Capacity & Energy Costs
Docket No. 81-071-F

Dear Ms. Wilson:

Attached is EAI's Avoided Capacity and Energy Cost Bulletin No. 53 containing the avoided capacity and energy costs to be applied under Rate Schedule Rider M23. It is intended that these costs would become effective January 1, 2007 and would be updated in approximately 6 months from this date.

If you need further information, please let me know.

Sincerely,

William R. Morgan
Manager, Regulatory Affairs

WM/tj
Attachment
c: Ms. Diana Brenske

ENTERGY ARKANSAS, INC.
AVOIDED CAPACITY AND ENERGY COSTS
APPLICABLE TO RIDER M23
- ARKANSAS -

AVOIDED CAPACITY COSTS:

Capacity - $0.0 per kW of capacity under a long-term contract subject to approval of the Arkansas Public Service Commission.

AVOIDED ENERGY COSTS:

		Summer Period Energy Deliveries		Other Period Energy Deliveries		Annual
Voltage Level of Purchase		On-Peak	Off-Peak	On-Peak	Off-Peak	Average
Generation -	¢/kWh	6.816	4.022	6.638	3.788	5.519
Transmission ≥230kV -	¢/kWh	6.907	4.056	6.647	3.774	5.543
Transmission <230kV -	¢/kWh	7.042	4.135	6.777	3.848	5.651
Primary -	¢/kWh	7.329	4.303	7.052	4.004	5.881
Secondary -	¢/kWh	7.504	4.406	7.221	4.100	6.022

SEASON/TIME PERIOD DEFINITION:

Summer Period:	April 1st – September 30th
On-Peak Hours:	7:00 a.m. - 11:00 p.m., Monday – Saturday
Off-Peak Hours	All hours not designated as on-peak hours

Other Period:	October 1st – March 31st
On-Peak Hours:	7:00 a.m. - 11:00 p.m., Monday - Saturday
Off-Peak Hours	All hours not designated as on-peak hours

NOTES:

(1) The avoided energy costs in this Bulletin were developed to be applicable to total energy of 100 MW per hour.

(2) The avoided energy costs in this Bulletin are adjusted to reflect the various losses appropriate to the voltage level at which purchases are made.

(3) This Bulletin is applicable in the EAI load control area only.

(4) Average annual numbers are shown for informational purposes and may be used for purchases from small qualified facilities if time of use metering is not economical.

Avoided Costs Bulletin No. 53
Effective January 1, 2007
ESI Rate Administration
Little Rock, Arkansas

WBM-SR-3 Press Releases Regarding Entergy's Commitment to Cap and Reduce Greenhouse Gas Emissions

Entergy.
THE POWER OF PEOPLE™

May 10, 2006
For Immediate Release

Contact: Suzanne Whitaker
Entergy
scousin@entergy.com

Charles Miller
Environmental Defense
cmiller@environmentaldefense.org
(202) 572-3364

Entergy Announces a Second Five-Year Commitment to Reduce Greenhouse Gas Emissions

and Signs Memorandum of Understanding with Environmental Defense

New Orleans, La. – Entergy Corporation (NYSE:ETR), one of the nation's leading electricity providers, has pledged – for a second time – to make a voluntary commitment to reduce greenhouse gas emissions from its operating plants and stabilize those emissions at a level 20 percent below year 2000 from 2006-2010. This second commitment is part of Entergy's long-term reduction target, which was originally announced in May 2001 and was implemented in partnership with Environmental Defense, a national environmental advocacy group.

Entergy was the first U.S. electric company to publicly announce such a greenhouse gas emissions target in 2001. The New Orleans-based company partnered with Environmental Defense to develop a program to reduce carbon dioxide emissions from Entergy's plants in the United States that generate electricity through burning fossil fuels.

In recognition of the first commitment made in May 2001, Entergy and Environmental Defense signed a Memorandum of Understanding for the second commitment on May 1, 2006, five years after the first commitment.

"Under the first voluntary greenhouse gas-limiting commitment that Entergy made in May 2001, the company exceeded its stabilization commitment and reduced its greenhouse gas emissions by 23 percent under the established target, while simultaneously increasing its electrical sales by 21 percent over the same time period. That kind of progress is exactly what our company, and hopefully others, needs in order to achieve emission reductions that will address climate change. We are very pleased with the progress we have made and are pushing forward with our second commitment to reduce greenhouse gas emissions even further in the 2006-2010 time frame," said Gary Serio, vice president of Safety and Environment for Entergy.

"Entergy is proving every day that it's possible to cap and reduce greenhouse gas emissions, make money, and provide power for jobs and growth," said Environmental Defense President Fred Krupp. "Their leadership has been exemplary and we're pleased to be working with them."

The first commitment Entergy made from 2000-2005 was met through both internal and external greenhouse gas reduction projects, including 61 internal reduction projects and 13 external projects, which encompassed carbon sequestration on company-owned property and greenhouse gas emission trades. The second

commitment will also be a mix of internal and external carbon-reducing projects beneficial to Entergy's generation plants, as well as to the company's customer service territory.

Entergy Corporation is an integrated energy company engaged primarily in electric power production and retail distribution operations. Entergy owns and operates power plants with approximately 30,000 megawatts of electric generating capacity, and it is the second-largest nuclear generator in the United States. Entergy delivers electricity to 2.7 million utility customers in Arkansas, Louisiana, Mississippi, and Texas. Entergy has annual revenues of over $10 billion and approximately 14,000 employees.

Environmental Defense, a leading nonprofit organization based in New York represents more than 400,000 members. Since 1967 it has linked science, economics and law to create innovative, equitable, and cost-effective solutions to the most urgent environmental problems.

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Entergy's online address is www.entergy.com.

Carbon Disclosure Project, May 31, 2006

The Reporting period for emissions is January 1, 2005 to December 31, 2005

1. *General*: How does climate change represent commercial risks and/or opportunities for your company?

Risk of inaction or an inadequate global response to climate change poses potential long term risks to the economic viability of Entergy's franchise territory and to its asset base both of which are located in an area that is uniquely vulnerable to flooding and hurricanes. Future revenues are dependant on a sustainable economic base. However, many of the people in the areas we're serving are living in poverty. We believe the impacts from increased greenhouse gas concentrations in the atmosphere will melt polar ice, raise sea levels, erode coastal lands, increase the intensity of storms, flood regions of the Mississippi delta, reduce crop production, increase storm damage, endanger water supply, increase disease and eliminate certain species of animals. The economic impacts of climate change on regions like the delta (states of Arkansas, Mississippi and Louisiana) will adversely impact those least able to bear the burden.

In 2005 Hurricanes Katrina and Rita put a face on the future physical risks and financial impacts that climate change can place on the markets we serve if meaningful action is not taken soon to stabilize and then reduce atmospheric greenhouse gas concentrations. These hurricanes inflicted overwhelming personal loss and massive property damage across our service territory. Katrina leveled much of a 400 mile section of coastline stretching from central Louisiana, across Mississippi, into Alabama and western Florida and devastated the city of New Orleans. Lives were lost, families split apart and homes destroyed. At the peak, more than 1.1 million of our customers lost power – the highest number of outages in our company's history. Much of our infrastructure across Louisiana, Texas and Mississippi was damaged and many of our offices in New Orleans, La. had moderate to severe damage due to the storm. Thousands of our employees and their families were displaced from their homes, including 1,500 headquarters employees. We incurred restoration costs for these two storms of approximately $1.5 billion which does not include lost revenues. Insured losses for the region are estimated to be $75 billion and the overall damages are expected to be as high as $200 billion.

As our communities move from recovery to rebirth, we have the opportunity and the responsibility to rebuild the right way. We must address the underlying causes of huge issues like poverty and climate change -- no matter how difficult it might be -- and then rebuild our communities in a sustainable way. For example, one of the most important ways we can help our low-income neighbors is by ensuring that new and reconstructed homes meet high standards for energy efficiency. This one initiative can reduce energy costs for low-income families, increase their disposable income and help fuel the economy and reduce emissions. As homes are repaired and new houses built across our service territory, we will work to educate, inform and influence communities to adopt environmentally smart building standards.

More than ever, we believe it is imperative to take action to slow and then reduce atmospheric concentrations of greenhouse gases. We also believe that delay in responding to climate change will remove economically viable options for stabilizing CO_2 concentrations in the atmosphere that are currently available and will result in higher cost response actions when greenhouse gas stabilization policies are finally adopted.

2. *Regulation*: What are the financial and strategic impacts on your company of existing regulation of GHG emissions, and what do you estimate to be the impact of proposed future regulation?
Due to the low-emission, low-carbon fuel mix of Entergy's fleet relative to other U.S. electric generating companies, we expect to fare better than most under the various carbon cap and trade policies being considered in the U.S. Congress. While our compliance costs will rise, our overall asset value will increase relative to other generating companies that are more heavily reliant on higher carbon content fossil fuels.

Future regulation of GHG emissions could have a significant impact on the selection of new generating assets assuming the regulation is in place soon enough to influence investment decisions. The demand for energy is expected to increase by 50% over the next 25 years. Decisions on what generation technologies to invest in to meet the increased demand will need to be made within the next 5-10 years. Decisions made today that do not consider appropriate price signals for carbon emissions could ultimately result in the construction of long lived generating assets that may not be competitive in a carbon constrained economy.

3. *Physical risks*: How are your operations affected by extreme weather events, changes in weather patterns, rising temperatures, sea level rise and other related phenomena both now and in the future? What actions are you taking to adapt to these risks, and what are the associated financial implications?
Entergy's regulated utility service area is located in the Gulf Coast region (parts of Louisiana, Mississippi, Arkansas and Texas) and can be impacted by hurricanes and strong thunderstorms during summer months and ice storms during the winter. Major storm events, as demonstrated by Hurricanes Katrina and Rita, damage infrastructure, cause energy outages, lost revenues, interfere with the delivery of fuels to generating units and can result in potentially large economic impacts to the region. In addition, these storms accelerate the loss of coastal wetlands. Coastal wetlands and barrier islands provide a protective defense from storm surge for low-lying inland regions reducing damage from hurricanes. For every mile of wetlands, the effect of storm surge is reduced by ½ foot. 1990 to 2001 the average rate of loss was 4.3 square miles per year. Hurricane Katrina caused the loss of roughly 40-65 square miles of wetland in the basin. In one day more wetlands were lost than the entire decade from 1990 to 2000.

The massive flooding in and around New Orleans put a harsh spotlight on an environmental crisis that has been years in the making. We believe that the impacts expected from climate will only exacerbate these physical risks. The loss of wetlands in southeastern Louisiana left the city more exposed and extremely vulnerable to damaging storms. And it's not just New Orleans that is threatened. Wetlands have been lost in many coastal areas of Louisiana, leaving hundreds of communities at risk. In the wake of Hurricane Katrina, we are redoubling our efforts in support of wetland restoration. We are working closely with local, state and federal governments and other organizations to increase the effectiveness of restoration efforts. We are also working with various public and private programs on a regular basis to maximize the funding they provide for coastal and wetland protection and restoration projects.

More importantly, we believe that as a society we must address the root cause of this crisis, which is linked to the broader sustainability concern of global warming and sea level rise. We believe meaningful action must be taken to slow and then reduce atmospheric concentrations of greenhouse gases such as CO_2. Entergy is a strong advocate for establishing mandatory greenhouse gas cap and trade legislation in the U.S. We are working with our partners the Clean Energy Group, Environmental Defense and the Pew Center Business Environment Leadership Council to advocate for meaningful measures to avoid dangerous impacts from climate change. We also have worked to support the development of the Regional Greenhouse Gas Initiative (RGGI), a mandatory cap and trade program being implemented by northeastern states. We are

using lessons learned implementing our voluntary GHG stabilization commitments to help demonstrate and encourage economically efficient greenhouse gas policy.

4. *Innovation*: What technologies, products, processes or services has your company developed, or is developing, in response to climate change?

Clean energy technologies can be employed to achieve emission reductions.

- Nuclear generation produces electricity without air emissions. 33% of Entergy's generating capacity is supplied by nuclear power. Entergy has added 355 MW of nuclear capacity through 2005 from up-rates and plans an additional 95 MW in 2006. In 2005, 52% of the domestic utilities' electric energy was produced by nuclear power plants compared to 40% in 1998. The increase in nuclear production through up-rates and improved capacity factors helps Entergy meet a growth in demand while allowing an overall reduction in CO_2 emissions. Entergy is a member of Nustart and is working to develop the next generation of nuclear power plants. Nuclear generating capacity, within a balanced portfolio of clean energy technologies allows growth, provides a hedge against fuel price volatility, increased environmental control costs and will provide low cost, competitively priced power in a carbon constrained economy.
- Combined Cycle Gas Turbines (CCGT) and Integrated Gasification Combined Cycle (IGCC) Technologies produce electricity more efficiently, using less fuel and with lower emissions rates. Entergy has recently acquired 1,198 MW of CCGT capacity to help meet projected demand and modernize its fossil fleet. Entergy is following the development of IGCC technologies that offer the added benefits of fuel flexibility, low emissions, affordable CO_2 capture for geologic sequestration and the ability to produce added value streams such as hydrogen, steam, CO_2, ammonia and sulfur that can be configured and sold to specific markets. Developing and deploying these generation technologies within a balanced mix of clean energy technologies reduces fuel costs, reduces environmental control costs and will add additional value streams all of which will contribute to low cost, competitively priced power in a carbon constrained economy.
- Renewable generation technologies such as wind, hydro and solar produce electricity without producing air emissions. Entergy owns 80 MW of wind power and in 2004 joined with Shell Wind in a Joint Venture to look for profitable opportunities to develop wind resources. Entergy has purchased over 500,000 emission reduction credits generated from landfill methane and coal mine methane recovery projects. Developing renewable resources within a balanced portfolio of clean energy technologies allows growth, provides a hedge against fuel price volatility, increased environmental control costs and will provide low cost, competitively priced power in a carbon constrained economy.
- CO_2 capture and geologic sequestration reduces emissions to the atmosphere. Entergy is a member of the Gulf Coast Carbon Center and is looking to demonstrate carbon capture technologies, conduct research into geologic sequestration monitoring and verification, and looking to develop an infrastructure in the Gulf Coast region to utilize anthropogenic CO_2 for enhanced oil recovery. Developing a cost effective source of CO_2 from anthropogenic sources will add to the secure domestic supply of energy and will enhance the economy within franchise territory. It could also create a value stream for the collection and sale CO_2 from plant stack gases that will allow the use of abundant domestic coal supplies in a way that helps the environment. Entergy has purchased 1,500,000 emission reduction credits from enhanced oil recovery projects.

5. *Responsibility*: Who at board level has specific responsibility for climate change related issues and who manages your company's climate change strategies? How do you communicate the risks and opportunities from GHG emissions and climate change in your annual report and other communications channels?

Responsibility:

Gary Serio, VP Safety & Environment manages the company's climate strategy. J. Wayne Leonard, CEO and the Safety & Environmental Executive Forum approve climate change strategy and monitor its execution. The Forum meets quarterly. Robert Luft, Chairman of the Board and J. Wayne Leonard, CEO are engaged in climate change issues from the board level. The Board Audit Committee annually assesses risks and controls associated with environmental issues including climate change.

Communication:

At Luft and Leonard's direction, Entergy in 2001 became the first U.S. electric generating company to voluntarily commit to stabilizing its greenhouse gas emissions. It committed to stabilize CO_2 emissions from its power plants at 2000 levels through 2005. Reasons for taking the action and progress towards achieving the goal are communicated annually in the "Greenhouse Gas Reduction Commitment and Progress Report", the Sustainability Report, SEC 10K Report, Dow Jones Sustainability Index Questionnaire response, and the Carbon Disclosure Project response.

In the 2002 Annual Report, Robert Luft, Chairman of the Board and J. Wayne Leonard, CEO communicated the company's aspirations. One of those aspirations was that "Entergy will be recognized as an environmental leader, not only in generation, but among all U.S. industrial companies, and will demonstrate the advantage of environmental excellence in achieving financial results". Every year since then, progress towards realizing those aspirations has been communicated in the Chairman and CEO's Letters to Stakeholders in Entergy's Annual Reports and in its annual Sustainability Reports. Every year they've highlighted the company's commitment to addressing climate change as a major element of that progress.

J. Wayne Leonard gave a speech to the Southern Governor's Conference in 2002 identifying the importance of passing mandatory climate change legislation. Bob Luft gave a speech to the Environmental Journalists Conference in 2003 urging meaningful action to address climate change.

In 2006, J. Wayne Leonard approved the 2006 – 2010 Environmental Strategy and as an element of that strategy, a second voluntary commitment to stabilize CO_2 emissions at 20% below 2000 levels from 2006 – 2010 was announced May 9, 2006.

6. *Emissions*: What is the quantity in tonnes CO2e of annual emissions of the six main GHG's produced by your owned and controlled facilities in the following areas, listing data by country?
- Globally.....Operations entirely within the U.S. and reported below
- Annex B countries of the Kyoto Protocol. N/A
- EU Emissions Trading Scheme. N/A

2005 GHG Inventory (10^6 short tons CO2e)

CO_2	CH_4	N_20	HFCs	PFCs	SF_6
35.6	0.4	0.3	0.0	0.0	0.3

The inventory was prepared using the WRI/WBCSD protocol and includes direct emissions from US operations. Carbon dioxide resulting from the combustion of fossil fuels used to generate electricity is the main source of greenhouse gas emissions from Entergy's operations. Entergy has defined its greenhouse gas footprint as CO_2 emissions from its ownership share of U.S. power plants. Emissions from the other five greenhouse gases are much less significant in absolute terms. CO_2 emissions from stationary sources are measured by in-stack continuous emission monitors and reported as short tons of CO_2. Continuous Emission Monitors are operated in compliance with stringent Quality Assurance regulations established by the US Environmental Protection Agency. In addition Entergy employs an independent 3rd party audit and evaluation annually to verify CO_2 measurements.

7. *Products and services*: What are your estimated emissions in tonnes CO2e associated with the following areas and please explain the calculation methodology employed.
- Use and disposal of your products and services?
- Your supply chain?

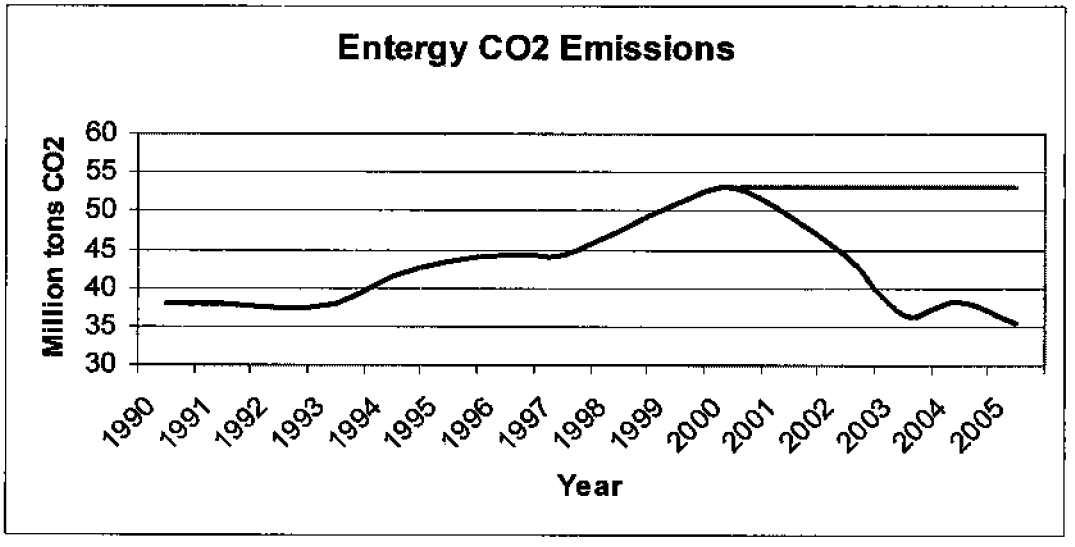
Entergy believes working with customers and suppliers could result in future business opportunities as more US companies adopt GHG reduction targets.

- Electricity is unique in that its end-use does not result in emissions or involve disposal of a product. In some cases a customer can achieve GHG reductions by substituting electricity generated from very low or non-emitting sources for their direct use of fossil fuels.
- Over 70% of Entergy's fly ash produced from burning coal is sold for re-use in the cement industry. Using fly ash as a raw material reduces fuel use and resultant CO_2 emissions from cement production. Entergy is developing a method for creating and registering emission reduction credits that will monetize the GHG emission savings realized from this practice.
- Entergy is investing in Energy Efficiency projects to help customers reduce energy consumption and is looking to quantify the GHG emission savings. Entergy is also working with stakeholders to help achieve an energy efficient rebuilding of New Orleans properties damaged by hurricane Katrina.
- Entergy is implementing its Environmental Management System and as business units establish continuous improvement goals, we anticipate process and production efficiency measures will incorporate both indirect and supply chain emission reduction initiatives.

8. Emissions reduction: What is your firm's current emissions reduction strategy? How much investment have you committed to its implementation, what are the costs/profits, what are your emissions reduction targets and time-frames to achieve them? Explain to what extent current and future emissions reductions involve a change of use in existing assets (i.e. fuel switching at existing facilities) or a need for new investment? What percentage of your revenue is derived from renewable generation in a government sponsored price support mechanism?

May 9, 2006 Entergy publicly announced its second voluntary commitment to stabilize CO_2 emissions at 20% below 2000 levels from 2006 – 2010. This will require actions to eliminate or offset an increase in emissions anticipated from a growth in the demand for energy that is expected during this period of time. See response to question #4 for actions that are being taken to reduce emissions. In addition, Entergy has allocated $3 million through the commitment period to purchase external emission offsets.

In May 2001, Entergy became the first U.S. electric power company to establish a voluntary stabilization target for its CO_2 emissions. Entergy pledged that it would stabilize CO_2 emissions from its U.S. power plants at year-2000 levels through 2005. In 2005, Entergy completed its first five year greenhouse gas stabilization commitment with cumulative emissions 23% (61.7 million tons) below goal. Below is a chart showing Entergy's annual CO_2 emissions from 1990 – 2005. The chart shows Entergy's progress meeting its voluntary commitment to stabilize CO_2 emissions from US power plants at year 2000 levels through 2005. Electric sales increased by 21% during the first commitment period.



Entergy invested $14.8 million in Environmental Initiatives Funds to complete 61 internal emission reduction projects that will achieve 6.2 million tons of CO2e reductions by 2010. The CO_2 emission reductions from internal projects resulted from investments in power plant efficiency improvements such as turbine upgrades and computerized control systems.

9. *Emissions trading*: What is your firm's strategy for, and expected cost/profit from trading in the EU Emissions Trading Scheme, CDM/JI projects and other trading systems, where relevant?

Entergy has invested in a portfolio of external emission offset initiatives in the voluntary U.S. greenhouse gas emission offset market. Entergy's external greenhouse gas emission offset portfolio includes forest sequestration projects, a first of its kind agricultural sequestration lease, geologic sequestration for enhanced oil recovery, landfill methane and coal mine methane recovery for energy generation and a solar renewable energy project. Most recently Entergy completed a greenhouse gas emission reduction purchase with a paper company in Maine that invested in natural gas energy efficiency in order to reduce emissions. This trade represents 300,000 metric tons of greenhouse gas emission reductions and is the type of trade contemplated under the recent Regional Greenhouse Gas Initiative (RGGI) being launched in northeastern U.S. Through the end of 2005, Entergy has invested $5.5 million from our Environmental Initiative Fund to complete 15 external offset projects that will achieve 3.6 million tons of CO2e offsets by 2005.

10. *Energy costs*: What are the total costs of your energy consumption, e.g. fossil fuels and electric power? Please quantify the potential impact on profitability from changes in energy prices and consumption.

In 2005 Entergy's consolidated revenues were $10.1 billion. Fossil fuels and fuel related costs amounted to $2.2 billion in 2005. 48% of the electricity Entergy generated for its domestic utility in 2005 used fossil fuels.

The U.S. Energy Information Administration (EIA) released its report titled, *Energy Market Impacts of Alternative Greenhouse Gas Intensity Reduction Goals,* in March 2006. EIA's report analyzes impacts from seven different greenhouse gas (GHG) intensity reduction goals and safety valve prices on economic growth.

The Cap-Trade 4 scenario is the only one that appears to satisfy the IPCC goal of slowing the growth and then reducing greenhouse gas emissions. If that level of price signal were to be sent, the analysis predicts that in 2030:

- Energy generation from coal will decline from today's levels by 40% and generation from natural gas, nuclear and renewables would increase by 37%, 123% and 332% respectively;
- To meet that demand, the industry will build 17 GW of new coal capacity with CO_2 capture and sequestration and 123 GW of new nuclear capacity;
- Greenhouse gas emissions will decrease by 28% from the reference case and will be only 0.5% above today's levels;
- Electricity prices will increase 30% from today's levels;
- GDP will decline by 0.55% from the reference case.

By contrast, if the level of price signal from the more modest Cap-Trade 1 scenario were to be sent, the analysis predicts that in 2030:

- Energy generation from coal will increase from today's levels by 43%, natural gas by 52%, nuclear by 30% and renewables by 108%;
- To meet that demand, the industry will build 96 GW of new coal capacity without carbon capture and sequestration and 25 GW of new nuclear;
- Greenhouse gas emissions will decrease by 9% from the reference case and will be 27% above today's levels but perhaps not enough to avoid catastrophic climate change impacts;
- Electricity prices will increase by 8% from today's levels;
- GDP will decline by 0.12% from the reference case.

The analysis puts in sharp focus the uncertainty facing the electric generating sector as the industry looks to place bets on new capacity investments that will be needed to meet the forecasted increase in demand for energy. The question is shifting away from "if there is mandatory CO_2 legislation?" to a question of "when will we have legislation?" and "how stringent will the cap be?" Decisions we make today will have a dramatic impact on the future climate change adaptation costs society will bear.

While the analysis does a good job evaluating the cost impacts of various greenhouse gas intensity limits, it doesn't quantify the expected financial benefits to be realized by avoiding climate change impacts and the improved health benefits that will come from relying on lower emitting generating technologies. We estimate that while the cost to the electric sector from climate change legislation will increase, after factoring in the expected health and environmental benefits of reduced emissions, we believe there will be a net long term benefit to the economy. Katrina cost estimates range from $150 -250 billion and put a face on what the potential future costs of adapting to climate change could place on the economy if meaningful action is not taken to mitigate the risk. The health benefits from lower emissions, and the avoided cost benefits for reducing adaptation to future climate change, need to be monetized and compared to the projected $248 to $800 billion reduction in GDP before reaching a conclusion on the benefits or harm that will come to the economy from placing caps on U.S. CO_2 emissions.

Furthermore, the economic analysis fails to recognize that a potential $200 billion investment in clean energy technologies over the next 20 years will stimulate the economy, creating jobs and reducing poverty. Bill Clinton in his speech to the United Nations Climate Change Conference in Montreal, December, 2005 said, "We can create jobs out of wind energy, out of solar energy, out of bio-fuels, out of hybrid engines, out of a systematic determination to change the lighting patterns, the insulation patterns, the efficiency standards of all buildings and all appliances. ...there are lots of hopeful signs here that if we decided to maximize clean energy development, maximize energy conservation technologies, maximize appropriate research, and have the best and most efficient use of old energy sources of oil and coal. If we did all of that, could we find common ground to do something before climate change makes it too late to have meetings like this?"

In a speech President Bush gave May 24, 2006 where he was advocating clean energy technologies he said, "We're also going to need a lot of electricity in the future. Electricity demand is projected to increase by nearly 50 percent over the next 25 years. That's a lot. And we better be wise about how we implement a strategy to meet that demand -- otherwise, we're not going to be the economic leader; otherwise, our people aren't going to be having the good jobs that we want them to have; otherwise, your children and my children, our grandchildren are not going to have a bright, hopeful America that we want for them."

CERTIFICATE OF SERVICE

I, M. Shawn McMurray, do hereby certify that on this 26th day of March, 2007, I provided a copy of the above and foregoing Surrebuttal Exhibits to the following, by first class mail, postage prepaid:

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