

January 10, 2012

Arizona Corporation Commission

Steve Olea, Director, Utilities Division

Honorable Arizona Corporation Commissioners

1200 W. Washington St.

Phoenix, AZ 85007



Docket E-01933A-11-0055

Regarding Tucson Electric Power Company Application for Approval of its 2011-2012 Energy Efficiency Implementation Plan.

PERSONAL INTRODUCTION

My name is Russell J. Lowes, I live in Tucson and am a Tucson Electric Power customer. I am currently the Research Director for SafeEnergyAnalyst.org. I live at 3339 E. Seneca Street in mid-town Tucson.

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TESTIMONY ON DECOUPLING AND ENERGY EFFICIENCY

The current rate system for Arizona utilities is tied to two energy growth indicators. They are the total capital investment and total revenue. I am testifying in favor of putting Tucson Electric Power on track to achieve a 22% production decrease through energy efficiency by 2020.

I also support full decoupling as integral to keeping rates in check with declines in sales due to energy efficiency.

Today, I would like to present the context in which the U.S. has been for 38 years pursuing energy efficiency, and how the impacts on electric bills can be positive.

The U.S. has radically reduced its energy production in relation to economic expansion. In 1973, the total Gross Domestic Product of the U.S. was $4.9 trillion, in 2010 constant, or real dollars. Thirty-eight years later, in 2011, the GDP went up to about $13.2 trillion. This is an increase of about 2.7 times.

Meanwhile, energy production went up from 76 quads (quadrillion Btu), or units of energy, in 1973 to about 98 quads in 2011. This is only a 29.6% increase.

Think about it, a 170% increase in economic output and only a 29.6% increase in energy production. See the attached three tables and graphs pages that give you the actual data from the U.S. Energy Information Administration and the U.S. Bureau of Economic Analysis.

With such high improvement in energy use, it is easy to see where momentum is in the U.S. energy realms. It is not in coal plant expansion, which has seen a drop of coal plants on the boards from 150 to about 50 over the last 5 years. It is not in nuclear plants, which has seen a flattening out of reactor numbers nationally and a drop-off in reactors globally. It is not really even in natural gas, which has only been picking up some of the slack of coal production decreases.

The largest energy movement has been in energy efficiency. Yet, top energy analysts such as Arjun Makhijani of the Insititute for Energy and Environmental Research and Amory Lovins of the Rocky Mountain Institute, are saying that while the momentum is in the right direction, it needs to amplify. They say we can reduce our energy production by still another 80%. With this improvement in efficiency comes an improvement in economic vitality. They support regulatory efforts to supplement the energy efficiency drive that is occurring in this nation.

The other area I would like to address is that of the cost of energy for the typical Tucson Electric Power residential customer.

The fourth page of tables and graphs, attached, is of what the current bill is for residents,

along with the water consumption at the plant that provides the electricity and the CO2 associated with the burning of fossil fuels.

You can see that in the example I have given, with a 25% reduction in energy consumption through energy efficiency, with a slight transition from old natural gas plants to new ones, with a reduction in coal to be picked up partially by solar (mostly by energy efficiency), the new bill is calculated. Along with this the CO2 goes sharply down, the water consumption goes sharply down.

Energy efficiency has the free market support, the mandate of the Commission and is the least expensive energy option for T.E.P. customers.

Please enforce strict compliance with the Commission's energy efficiency plans with Tucson Electric Power. It will help get southern Arizona on the right track to a better energy future.

Thank you.

Russell Lowes
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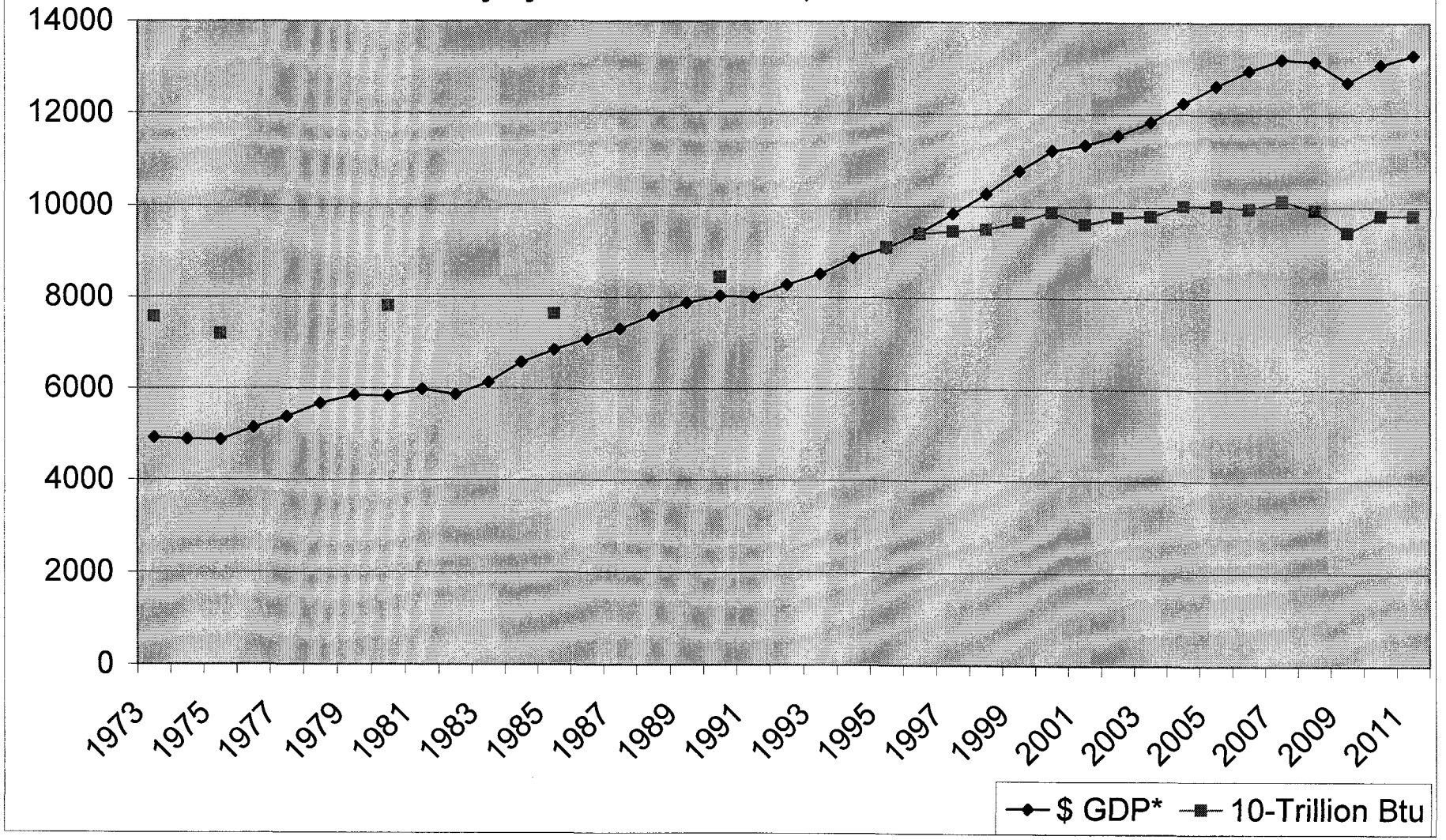
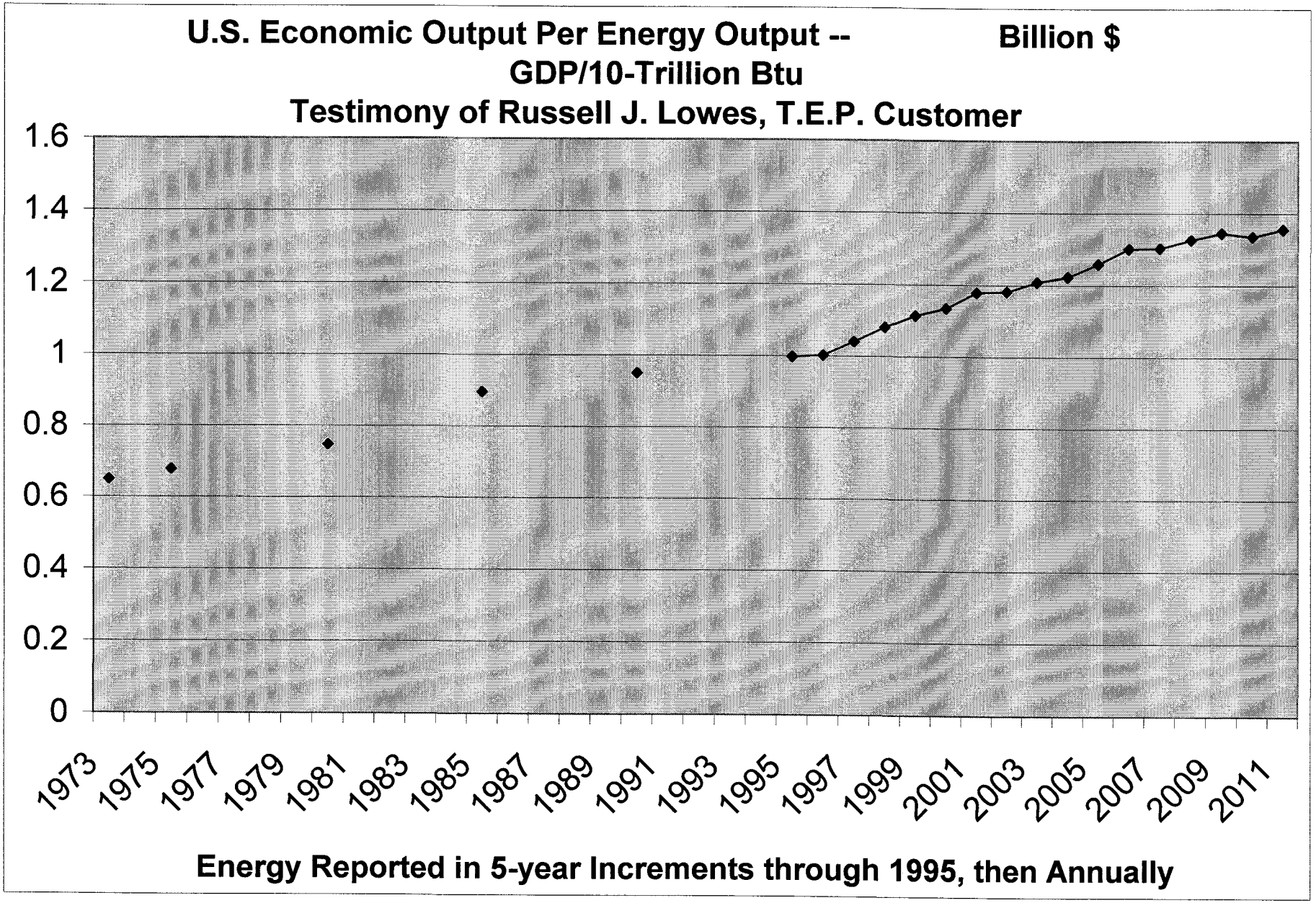
# U.S. Economic Output and Energy Use

## $ GDP and Units of Ten-Trillions Btu

## Testimony by Russell J. Lowes, T.E.P. Customer




U.S. Economic Output Per Energy Output -- GDP/10-Trillion Btu
Billion $
Testimony of Russell J. Lowes, T.E.P. Customer
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
Energy Reported in 5-year Increments through 1995, then Annually

Testimony of Russell J. Lowes, Research Director of www.SafeEnergyAnalyst.org and T.E.P. customer.
10-Jan-12

GDP and Energy Use In 10-Trillion Btu Per Year

| Year | $ GDP* | 10-Trillion Btu |
|---|---|---|
| 1973 | 4912.825 | 7568.4 |
| 1974 | 4885.75 | |
| 1975 | 4875.35 | 7196.5 |
| 1976 | 5136.925 | |
| 1977 | 5373.075 | |
| 1978 | 5672.775 | |
| 1979 | 5850.05 | |
| 1980 | 5833.975 | 7806.7 |
| 1981 | 5982.075 | |
| 1982 | 5865.925 | |
| 1983 | 6130.925 | |
| 1984 | 6571.525 | |
| 1985 | 6843.4 | 7639.2 |
| 1986 | 7080.5 | |
| 1987 | 7307.05 | |
| 1988 | 7607.4 | |
| 1989 | 7879.175 | |
| 1990 | 8027.025 | 8448.5 |
| 1991 | 8008.325 | |
| 1992 | 8280.025 | |
| 1993 | 8516.175 | |
| 1994 | 8863.125 | |
| 1995 | 9085.975 | 9102.9 |
| 1996 | 9425.85 | 9402.2 |
| 1997 | 9845.925 | 9460.2 |
| 1998 | 10274.75 | 9501.8 |
| 1999 | 10770.63 | 9665.2 |
| 2000 | 11216.43 | 9881.4 |
| 2001 | 11337.48 | 9616.8 |
| 2002 | 11543.1 | 9769.3 |
| 2003 | 11836.43 | 9797.8 |
| 2004 | 12246.93 | 10014.8 |
| 2005 | 12622.95 | 10027.7 |
| 2006 | 12958.48 | 9962.4 |
| 2007 | 13206.38 | 10136.3 |
| 2008 | 13161.93 | 9926.8 |
| 2009 | 12703.13 | 9447.5 |
| 2010 | 13087.98 | 9808.1 |
| 2011 | 13290.73 | 9808.8 |

Billion $ Per 10-Trillion Btu by Year

| Year | Billion$/10-Tbtu | $ GDP* | 10-Trillion Btu |
|---|---|---|---|
| 1973 | 0.649123329 | 4912.825 | 7568.4 |
| 1974 | | 4885.75 | |
| 1975 | 0.677461266 | 4875.35 | 7196.5 |
| 1976 | | 5136.925 | |
| 1977 | | 5373.075 | |
| 1978 | | 5672.775 | |
| 1979 | | 5850.05 | |
| 1980 | 0.747303598 | 5833.975 | 7806.7 |
| 1981 | | 5982.075 | |
| 1982 | | 5865.925 | |
| 1983 | | 6130.925 | |
| 1984 | | 6571.525 | |
| 1985 | 0.895826788 | 6843.4 | 7639.2 |
| 1986 | | 7080.5 | |
| 1987 | | 7307.05 | |
| 1988 | | 7607.4 | |
| 1989 | | 7879.175 | |
| 1990 | 0.950112446 | 8027.025 | 8448.5 |
| 1991 | | 8008.325 | |
| 1992 | | 8280.025 | |
| 1993 | | 8516.175 | |
| 1994 | | 8863.125 | |
| 1995 | 0.998140702 | 9085.975 | 9102.9 |
| 1996 | 1.002515369 | 9425.85 | 9402.2 |
| 1997 | 1.040773451 | 9845.925 | 9460.2 |
| 1998 | 1.081347745 | 10274.75 | 9501.8 |
| 1999 | 1.114371663 | 10770.63 | 9665.2 |
| 2000 | 1.135104843 | 11216.43 | 9881.4 |
| 2001 | 1.178923862 | 11337.48 | 9616.8 |
| 2002 | 1.181568792 | 11543.1 | 9769.3 |
| 2003 | 1.208069669 | 11836.43 | 9797.8 |
| 2004 | 1.222882634 | 12246.93 | 10014.8 |
| 2005 | 1.258808102 | 12622.95 | 10027.7 |
| 2006 | 1.300738276 | 12958.48 | 9962.4 |
| 2007 | 1.302879256 | 13206.38 | 10136.3 |
| 2008 | 1.325898074 | 13161.93 | 9926.8 |
| 2009 | 1.344601746 | 12703.13 | 9447.5 |
| 2010 | 1.334404727 | 13087.98 | 9808.1 |
| 2011 | 1.354979712 | 13290.73 | 9808.8 |

*2010 constant dollars; adjusted for inflation.

Sources:

For energy production figures: U.S. Energy Information Administration/Monthly Energy Review

For Gross Domestic Product figures: http://research.stlouisfed.org/fred2/data/depc1.txt,

U.S. Dept. of Commerce: Bureau of Economic Analysis.

# Your Electricity Bill, for Tucson Area Residents, Now and in the Future
## Your Personal Cost and the CO2 Emissions for Your Home
## An Interactive Blend of the Utilities' Grid Decisions and Your Choices on Energy Efficiency Savings and Solar Installation

**Spreadsheet by Russell Lowes, www.SafeEnergyAnalyst.org, 12/17/11 update**
**For questions/comments, e-mail: russlowes@gmail.com**
(to edit in PowerPoint: on slide, right click>Worksheet Object>Edit)

Just fill in the information in two boxes below and the spreadsheet will fill in everything else.

Notes:

kWhe means kilowatt-hours of electricity. CO2 is carbon dioxide, the most common greenhouse gas.

The fossil and nuclear electricity costs below are what go on your electric bill. While these figures are pre-subsidy for solar and wind, they are post-subsidy for fossil and nuclear energy (i.e., fossil & nuclear are much more subsidized on your bill). Nevertheless, even with this system bias for fossil and nuclear energy, a wise blend of energy efficiency and renewables are still cheaper than the old blend of fossil and nuclear energy, and are substantially less CO2-intensive.

Also, you may want to change the solar cost to about $0.10 (ten cents) on line 81, column A, in the blue box, if you want to show your post-rebate solar energy costs.

E-mail me with any questions or improvements at russlowes@gmail.com

| Typical Residential Consumption kWhe/Mo | Electricity With Different Mix of Energy Efficiency & Consumption kWhe/Mo | Prior Column kWhe Savings Over 25 years | |
|---|---|---|---|
| 750 | 750 | 225000 | Current consumption for a typical residence |
| $ 0.105 | $ 0.105 | | Cost per kilowatt-hour of electricity |
| $ 78.75 | $ 78.75 | | Total Approximate Cost Before Changes |
| **0.00%** | **25.00%** | **<1st box** | Asssumed % reduction in consumption of kWhe |
| 750 | 563 | 168,750 | New consumption level after EE program |
| 0 | 188 | 56,250 | Energy saved per month in kWhe/per 25 years |

| CO2 Output & Water Use | . . .See Below |
|---|---|

**Projected Blend of Energy in %**

| Old Mix | New Mix | | |
|---|---|---|---|
| 0.00% | 15.00% | **<2nd box** | New Solar PV |
| 70.00% | 50.00% | | Old Coal |
| 30.00% | 25.00% | | Old natural gas plants |
| 0.00% | 5.00% | | New natural gas plants |
| 0.00% | 0.00% | | New Nuclear |
| 0.00% | 5.00% | | New Wind |
| 0.00% | 0.00% | | Old Hydro |
| 100.00% | 100.00% | **(When entering %s, make sure this = 100%.)** | |

**Old Mix of Electricity Costs Compared to the New Mix of Costs**

| Old Mix | New Mix | Prior Column Over 25 years | Cost for Electricity for Each Source | Initial CO2/Month Output, Total Grams/Month | New Mix CO2/Month Output, Total Grams/Month |
|---|---|---|---|---|---|
| $ - | $ 16.88 | $ 5,062.50 | New Solar Photovotaics | 0 | 2,700 |
| $ 52.50 | $ 28.13 | $ 8,437.50 | Old Coal Plant Electricity | 504,000 | 270,000 |
| $ 26.25 | $ 16.41 | $ 4,922.44 | Old Natural Gas Plants | 112,500 | 70,313 |
| $ - | $ 4.22 | $ 1,265.63 | New Natural Gas Plants | 0 | 12,459 |
| $ - | $ - | $ - | New Nuclear | 0 | 0 |
| $ - | $ 4.22 | $ 1,265.63 | Wind | 0 | 253 |
| $ - | $ - | $ - | Old Hydro | 0 | 0 |
| **$ 0.03** | **$ 0.03** | **$ 0.03** | **Energy efficiency cost per kWhe** | 616,500 | 355,472 |
| **$ -** | **$ 5.63** | $ 1,687.50 | Energy efficiency cost per month | | V |
| **$ 78.75** | **$ 71.25** | **$ 21,375.56** | Total new cost of electricity | | V |
| **$ (0.00)** | **$ 7.50** | **$ 2,249.44** | **Savings each month & over 25 years** | | V |
| 0.0% | 1.0% | 1.0% | Savings as % of original bill | | V |
| | | | **Savings in Total CO2:** | | **42%** |
| | | | **Average CO2 per kWhe before&after:** | 822 | 632 |
| | | | **Savings of CO2 per kWhe:** | | 23% |

| Your kWhe Consumption Broken Down by Source | | | | Initial Powerplant Water Use In Gallons/Mo. | New Mix Powerplant Water Use In Gallons/Mo. |
|---|---|---|---|---|---|
| Old Mix/Mo. | New Mix/Mo. | Over 25 years | | | |
| 0 | 84 | 25,313 | New Solar PV | 0 | 0 |
| 525 | 281 | 84,375 | Old Coal | 263 | 141 |
| 225 | 141 | 42,188 | Old natural gas plants | 90 | 56 |
| 0 | 28 | 8,438 | New natural gas plants | 0 | 11 |
| 0 | 0 | | New Nuclear | 0 | 0 |
| 0 | 28 | | Wind | 0 | 0 |
| 0 | 0 | | Old Hydro | 0 | 0 |
| 750 | 563 | 168,750 | Total kWhe/Mo | 353 | 208 |
| $ 0.105 | $ 0.127 | | Total Cost Per kWhe | | |

## The Source Data

| Cost/Kilowatt-Hour (Same for both cols.)* | | Resulting kWhe Used | Initial CO2 Output Grams/kWhe | New Mix CO2 Output Grams/kWhe |
|---|---|---|---|---|
| $0.200 | $0.200 | New Solar PV | 32 | 32 |
| $0.100 | $0.100 | Old Coal | 960 | 960 |
| $0.117 | $0.117 | Old natural gas plants | 500 | 500 |
| $0.150 | $0.150 | New natural gas plants | 443 | 443 |
| $0.240 | $0.240 | New Nuclear | 400 | 400 |
| $0.150 | $0.150 | Wind | 9 | 9 |
| $0.100 | $0.100 | Old Hydro | 10 | 10 |
| $0.030 | $0.030 | Energy Efficiency | 5 | 5 |

*Note: The above costs are in mixed year dollars for gas and nuclear, depending upon the first year of availability. For new gas, units could be producing energy in 5 years, new nuclear in 11 years -- the following options are immediately available and are already being installed currently: new solar, wind, energy efficiency, so these are in current 2011 dollars. It is projected that no significant amount of new hydro will be available. However, offsetting this disadvantage to long-range projects, to some extent, is the massive amount of additional subsidies already counted as internal costs for nuclear and gas, that is, these gas and nuclear costs are already being charged to the ratepayer, and most of the externalities of the other options are not.

| Water, in Gallons/Kilowatt-Hour at the Electrical Plant | | |
|---|---|---|
| 0.0 | 0.0 | New Solar PV |
| 0.5 | 0.5 | Old Coal |
| 0.4 | 0.4 | Old natural gas plants |
| 0.4 | 0.4 | New natural gas plants |
| 0.8 | 0.8 | New Nuclear |
| 0.0 | 0.0 | Wind |
| 4.0 | 4.0 | Old Hydro |
| | | Energy Efficiency |