Costs and Payback Times

7/23/2010
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	Baseline	Baseline	Complete	Alternate for Comparison	
	Heating Baseboard Only	Heating and Cooling FCU's only	Heating and Cooling Baseboard and Min FCU's	Alt New Efficent Conventional Heating and Cooling	
	(Note: In lieu of baseboards could use all FCU's and put only air handler on emergency power) (however you will get cold spots esp. under windows and lose wall areas with big FCUs at ea window)				
Todds insulation and sealing work	$ 6,000	$ 6,000	$ 6,000	$ 6,000	
Ground loop	$ 10,000	$ 10,000	$ 10,000	$ 5,000	(3 ton AC unit for alt, with one replacement unit af
Baseboard / FCU distribution	$ 4,400	$ 6,300	$ 8,300	$ 8,300	
HP and related equip	$ 10,000	$ 10,000	$ 10,000	$ 4,000	(Oil fired boiler for alt)
Loan interest	$ 2,200	$ 2,200	$ 2,200		Loan interest adds 1 year to payback
GSHP Cost	$ 26,600	$ 28,500	$ 30,500	$ 17,300	
Total Upfront Insul - GSHP Cost 2010	**$ 30,400**	**$ 32,300**	**$ 34,300**	**$ 23,300**	
Total Upgrade Cost	$ 32,600	$ 34,500	$ 36,500	$ 23,300	
Central Hudson incentives	$ 1,200	$ 1,200	$ 1,200	$ 1,200	
Central Hudson cent AC incentive		$ 600	$ 600	$ 600	
Federal general $1,500 credit	$ 1,500	$ 1,500	$ 1,500	$ 1,500	
Federal GSHP credit	$ 7,980	$ 8,550	$ 9,150	0	
Total Credits	$ 10,680	$ 11,850	$ 12,450	$ 3,300	
GSHP final out of pocket Summer 2011	$ 15,920	$ 16,650	$ 18,050	$ 14,000	
Insul - GSHP final out of pocket Summer 2011	**$ 21,920**	**$ 22,650**	**$ 24,050**	**$ 14,000**	
Loan proceeds	$ 20,000	$ 20,000	$ 20,000	$ -	
Final Out of Pocket Summer 2011	$ 1,920	$ 2,650	$ 4,050	$ 14,000	
Costs and Savings					
					(**) = Additional Cost
Initial Yearly Savings After Insul	$ 1,486	$ 2,086	$ 2,086	$ (1,193)	AC elec costs in summer
Average Yearly Savings (next 20 yrs) After Insul	$ 4,032	$ 5,832	$ 5,832	$ (4,079)	changes svgs into costs
Life Cycle - app. total initial and operating costs	**$ 62,056**	**$ 98,786**	**$ 100,186**	**$ 216,342**	**Inc AC in all but first**
GSHP Years To Payback Simple	10.7	7.6	7.6	(14.0)	
All work Years To Payback Simple	11.2	8.0	8.0	(11.7)	
GSHP Years To Payback Approx. Life Cycle	3.9	2.7	2.7	(3.4)	
All work Years To Payback Approx. Life Cycle	4.1	2.9	2.9	(2.3)	

Energy Costs and Savings

7/23/2010
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Heating Only

Savings calculations based on monitored and installed system with smaller heating load than Catskills House currently

AS IS with GSHP Comparision

Corrections for Catskills House and current energy prices

Energy use,1.5 times 80 mill therms study used	120 mill therms				
		Energy Unit Cost			Total Energy Cost
Oil cost last year is 3.10 times the $1.00 per gallon the study system was calcuated from	avg	$ 3.10	gallon	$	3,794

Projected GSHP savings			$ 2,033
Proj COP	2.8	% Cost Reduction	54%

Savings calculated by converting oil used to electric then based on elec heat being app. 30% more expensive than oil and a HP app 300% more efficent than elec in a cold climate

$ 4,932.72	equiv htg cost in elec
$ 1,761.69	equiv htg cost in elec with GSHP
$ 2,032.71	savings btw oil and elec with GSHP

Insulated with GSHP Comparison

Energy Use	80 mill therms				
		Energy Unit Cost			Total Energy Cost
Oil: Projected 2010-11 Heating season, usually avgs end price prev. htg. season		$ 3.44	gallon	$	2,774

Projected GSHP savings			$ 1,486
		% Cost Reduction	54%

$ 3,606.72	equiv htg cost in elec
$ 1,288.11	equiv htg cost in elec with GSHP
$ 1,486.29	savings btw oil and elec with GSHP

Insulated and New Oil Fueled Hydronic System Comparison

Energy cost savings from As IS to new oil hydronic system from more efficent distribution and boiler efficencies and insulation

	Efficencies		Savings	
	Old	New		
Boiler	78%	85%	$	265.61
Distribution	81%	90%	$	341.50
			$	607.10

Future Projected Energy Prices

7/23/2010

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		Unit Costs		Yearly Cost			
		Elec	Oil	As Is Oil	Insulated Oil	GSHP Elec	Insulated New Oil
Past	1997	11.43	$ 1.06				
	2008	14.00	$ 3.29	actual	est	est	est
	2010	18.02	$ 2.10	$ 3,794	$ 2,774	$ 1,288	$ 2,167
Past Avg Yrly Inc		4%	8%				
			see note below				
Future	2011	15.00	$ 3.29	$ 3,794	$ 2,774	$ 1,288	$ 2,167
2	2012	15.67	$ 3.54	$ 4,081	$ 2,984	$ 1,345	$ 2,331
3	2013	16.36	$ 3.81	$ 4,389	$ 3,209	$ 1,405	$ 2,507
4	2014	17.09	$ 4.09	$ 4,720	$ 3,451	$ 1,467	$ 2,696
5	2015	17.84	$ 4.40	$ 5,076	$ 3,712	$ 1,532	$ 2,899
6	2016	18.63	$ 4.73	$ 5,459	$ 3,992	$ 1,600	$ 3,118
7	2017	19.46	$ 5.09	$ 5,871	$ 4,293	$ 1,671	$ 3,354
8	2018	20.32	$ 5.48	$ 6,314	$ 4,617	$ 1,745	$ 3,607
9	2019	21.23	$ 5.89	$ 6,791	$ 4,965	$ 1,823	$ 3,879
10	2020	22.17	$ 6.33	$ 7,304	$ 5,340	$ 1,904	$ 4,172
11	2021	23.15	$ 6.81	$ 7,855	$ 5,743	$ 1,988	$ 4,487
12	2022	24.18	$ 7.32	$ 8,448	$ 6,177	$ 2,076	$ 4,825
13	2023	25.25	$ 7.88	$ 9,085	$ 6,643	$ 2,168	$ 5,189
14	2024	26.37	$ 8.47	$ 9,771	$ 7,144	$ 2,264	$ 5,581
15	2025	27.54	$ 9.11	$ 10,508	$ 7,683	$ 2,365	$ 6,002
16	2026	28.76	$ 9.80	$ 11,301	$ 8,263	$ 2,470	$ 6,455
17	2027	30.04	$ 10.54	$ 12,154	$ 8,887	$ 2,579	$ 6,942
18	2028	31.37	$ 11.33	$ 13,072	$ 9,558	$ 2,694	$ 7,466
19	2029	32.76	$ 12.19	$ 14,058	$ 10,279	$ 2,813	$ 8,030
20	2029	34.21	$ 13.11	$ 15,119	$ 11,055	$ 2,938	$ 8,636
20 Year			**Total costs**	$ 165,170	$ 120,770	$ 40,136	$ 94,342
			Avg. yrly	$ 8,259	$ 6,038	$ 2,007	$ 4,717

Savings from As Is	$ 125,034
Savings from Insulated	$ 80,634
Savings from Insulated w/ New Oil System	$ 54,206

10 Year Costs

As Is Oil	Insulated Oil	GSHP Elec	Insulated New Oil
$ 53,800	$ 39,337	$ 15,781	$ 30,730

Note: Col to right was the actual yrly % inc in 13 yrs, 17% a year
this gave a final oil cost over $10 17%
within 10 yrs, which seems $ 3.44
impossible, yet, a 240% inc in the $ 4.03

last 13, another 240% and it's $10	$ 4.73
ekkkkkkkkkkkkkkkkkkk	$ 5.55
	$ 6.51
Lock up that corn, ethanol is	$ 7.63
going to be worth more than	$ 8.95
cocaine soon!	$ 10.49
	$ 12.31
	$ 14.43
	$ 16.92
	$ 19.85
	$ 23.27
	$ 27.29
	$ 32.01
	$ 37.54
	$ 44.02
	$ 51.62
	$ 60.54

BTU from various fuel sources Costs Compared

7/16/2010

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4 litres per gallon
1 btu = 1005 joules

Elec. Costs: Current / Past - for future projections

http://www.eia.doe.gov/energyexplained/index.cfm?page=electricity_factors_affecting_prices
See also following tabs in this excel sheet

	1997	2008	2009	2010		
Elec	8.43	11.00	*13.07*	*15.02*	*italics est*	NYS correction factor
adj Elec NY	*11.43*	*14.00*	16.07	18.02		3.00
Oil	1.06	3.29	2.5	2.1	rah actual was $3.44 but that yielded $10 a gallon in 10 yr, possible???? see oil for source of 2.1	

Oil Costs: Current / Past - for future projections

http://tonto.eia.doe.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=D200112362&f=A
See also following tabs in this excel sheet

Ne
F
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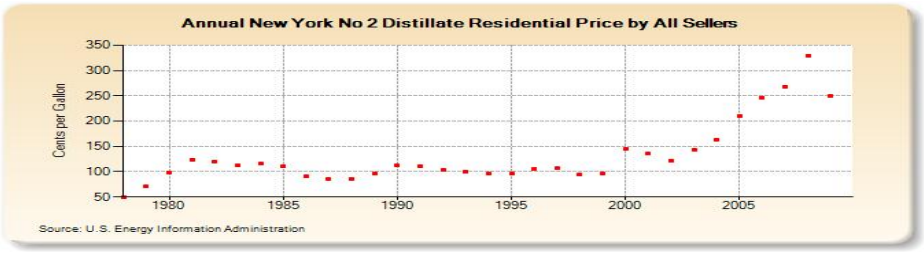


Selected fuel costs below from -

http://www.ag.ndsu.edu/pubs/ageng/structu/ae1015.htm

If a homeowner wants to estimate annual home heating cost, the following chart may give some help. A well-insulated, 1,500 square foot home in North Dakota will require about 80 million Btus of heat during a year's time. A 3,000 square foot well-insulated home will require about two times as much energy. An older, poorly insulated 1,500 square foot home may require up to five times as much heat as compared to a well-insulated home. With fluctuating fuel costs, it is important for homeowners to insulate walls and ceilings and seal cracks around doors and windows along with selecting a new heat source.

Estimated Annual Heating Cost for Selected Fuels*

Fuel Type	Heating Efficiency	Fuel Cost	Energy use per year for a 1,500 square foot home	Energy cost for a well insulated 1,500 square foot home
Elec. Res. ..... 3413 Btu/kWh	100%	$0.03/kWh	23440 kWh	$703.20
Propane ..... 92,000 Btu/gal	92%	$0.90/gal	945 gal	$850.50
Natural Gas ... 100,000 Btu/therm	92%	$0.70/therm	870 therms	$609.00
Fuel Oil ..... 140,000 Btu/gal	70%	$1.00/gal	816 gal	$816.00
Coal ..... 6,600 Btu/lb	65%	$60.00/ton	9.32 tons	$559.20
Vegetable Oil . 130,000 Btu/gal	70%	$1.50/gal	879 gal	$1318.50
Shelled Corn .... 8,500 Btu/lb	65%	$2.00/bu	258 bushels	$516.00
Wheat Straw ..... 7,500 Btu/lb	65%	$30.00/ton	8.20 tons	$246.00
Wheat (Grain) ... 8,700 Btu/lb	65%	$3.00/bu	236 bushels	$708.00

Note: The chart includes only an estimate for fuel cost. It does not include costs for furnace equipment, installation of the equipment and fuel handling equipment.

- This chart is based on 9000 heating degree days (HDD) for North Dakota. The estimated annual heat use for a 1500 sq. ft. well-insulated home is 80 Million BTU for a heating season. This is determined from a home with the following

- This chart is based on 9000 heating degree days (HDD) for North Dakota. The estimated annual heat use for a 1000 sq. ft. well-insulated home is 80 Million BTU for a heating season. This is determined from a home with the following R-values: Walls R-19, Ceiling R-38, Basement walls R-10 and including an air infiltration rate of 0.5 air changes per hour.

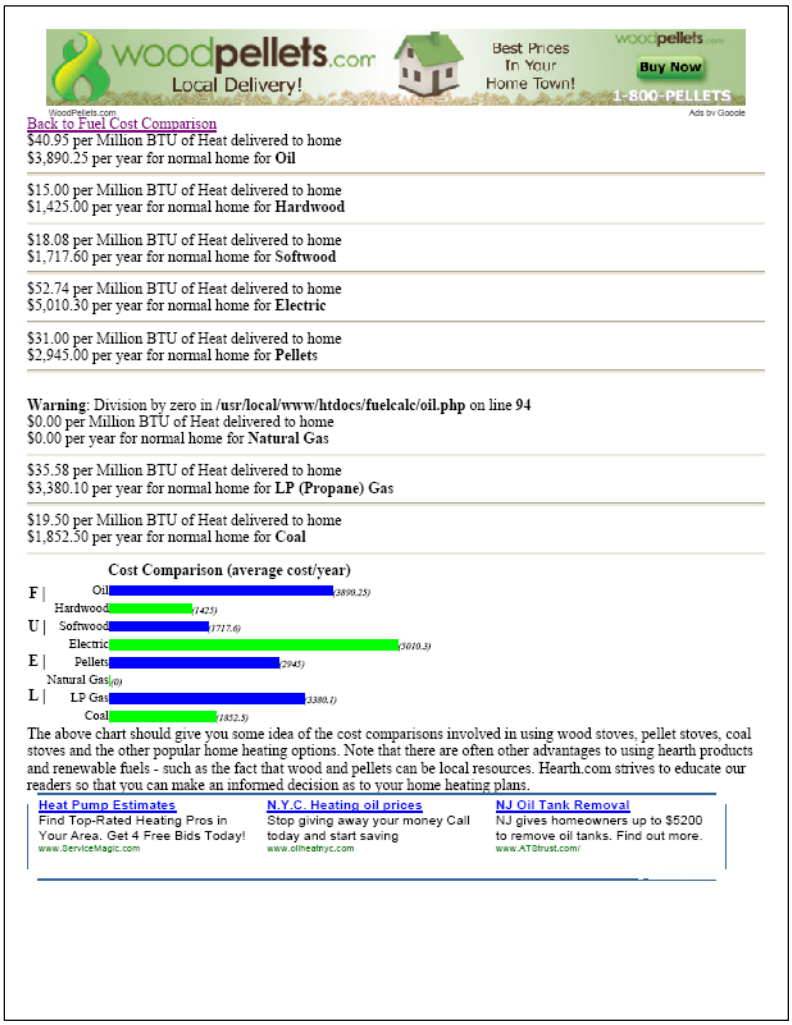
Heating Unit Relationships

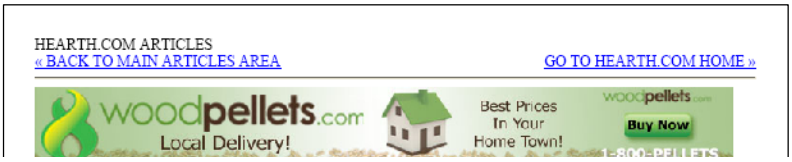
Natural Gas

- 1 cubic foot = 1000 Btu
- 100 cubic feet = 100,000 Btu = 1 Therm

Electric

Comparison of fuel source costs below from -
http://www.hearth.com/econtent/index.php/articles/fuel_cost_comparison_calculator/
More for curiosity than useful to GSHP analysis





ARTICLES - General - Fuel Cost Comparison Calculator

Enter the cost of each fuel below or use the defaults provided. Click here for average Fuel and LP Prices in New England and New York State

OIL	HARDWOOD	SOFTWOOD	ELECTRIC
Cost per gallon of oil in dollars	Cost per cord of in dollars	Cost per cord of in dollars	Cost per KWH of in cents
3.44	225	175	18
Efficiency 60 %	Efficiency 60 %	Efficiency 60 %	Efficiency 100 %
WOOD PELLETS or Corn	**NATURAL GAS**	**LP GAS**	**COAL**
Cost per ton of in dollars	Cost per therm in dollars	Cost per gallon in dollars	Cost per ton in dollars
300	0	2.5	325
Efficiency 60 %	Efficiency 0 %	Efficiency 78 %	Efficiency 60 %

Calculate

Cost of Fuels - Please enter the cost in US Dollars, using a decimal point where needed. Do not use the $ sign. Use a decimal point if needed - for instance, if you pay 1.50 cents a therm for gas, enter 1.50. Please notice that the electric calc asks for cost per KWH in cents, so no decimal point is needed except for fractions of a penny. (i.e. you pay 9.5 cents per KWH, enter 9.5)
Efficiency of Appliance - Common values are already entered. These are expressed as a percentage. Efficiency is defined as the percentage of available heat in the fuel that is actually delivered into the room. Some common efficiency ranges are given below.

Oil and Gas Furnaces	Gas (LP or Natural) Hearth Products
Older Models - 50% to 70%	Vented Gas Fireplace Logs - 5% to 15%
Newer Models - 70% to 85%	B-Vent Gas Fireplaces and Stoves - 35% to 65%
Wood Hearth Products	Direct-Vent Fireplace and Stoves - 40% to 80%
Open Wood Fireplace - 5% to 25%	Vent-Free Fireplaces, Stoves and Logs - 90%
Older Non-Airtight Stoves - 25% to 35%	**Coal Heating Systems**
Older Airtight Stoves - 40% to 60%	Older Coal Furnace/Boiler - 50% to 65%
Newer EPA Stoves and Fireplaces - 65% - 80%	Modern Coal Stove - 60% to 80%
Pellet Stoves	Stoker or Hopper-Fed Stove - 70% to 85%
Older Pellet Stove (pre-1994) - 50% to 65%	Electric Resistance Heat - 95% to 100%
Newer Pellet or Corn Stove - 65% to 80%	

Please rate this article by clicking once on the Like or Dislike box below:

Report No.: DOE/EIA-0226 (2010/06)
Data for: March 2010
Report Released: June 16, 2010
Next Release Date: Mid-July 2010

Table 5.6.A. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, March 2010 and 2009
(Cents per Kilowatthour)

Census Division and State	Residential		Commercial[1]		Industrial[1]		Transportation[[1]]		All Sectors	
	Mar-10	Mar-09	Mar-10	Mar-09	Mar-10	Mar-09	Mar-10	Mar-09	Mar-10	Mar-09
New England	**16.82**	**17.65**	**16.19**	**16.7**	**11.09**	**11.85**	**9.05**	**8.44**	**15.19**	**15.93**
Connecticut	19.36	20.36	16.51	16.99	14.74	19	13.9	13.4	17.49	18.67
Maine	15.43	15.13	12.34	12.65	9.3	10.81	--	--	12.64	13.16
Massachusetts	15.88	17.51	18.19	19.43	10.39	10.44	6.77	6.16	14.82	15.87
New Hampshire	15.99	16.66	13.98	15.54	12.58	13.93	--	--	14.56	15.74
Rhode Island	17.01	14.59	13.98	11.56	15.81	12.67	--	--	15.37	12.8
Vermont	15.22	14.62	13.37	12.82	9.69	9.51	--	--	13.19	12.77
Middle Atlantic	**15.19**	**14.17**	**13**	**12.8**	**8.8**	**8.21**	**13.36**	**13.64**	**12.99**	**12.46**
New Jersey	15.88	15.97	13.2	13.93	11.42	9.49	15.08	13.93	13.93	14.13
New York	18.02	16.72	14.79	14.29	10.64	11.1	14.72	14.85	15.52	14.86
Pennsylvania	12.44	11.18	10.05	9.48	7.81	7.17	8.09	8.95	10.23	9.42
East North Central	**10.78**	**10.78**	**9.13**	**8.97**	**6.08**	**6.62**	**6.71**	**9.29**	**8.7**	**8.87**
Illinois	10.94	11.71	8.17	8.48	7.4	7.78	6.49	9.09	8.9	9.4
Indiana	8.93	9.55	8.07	8.48	5.59	5.88	8.51	9.77	7.23	7.69
Michigan	11.8	10.96	9.81	9.15	6.43	6.8	10.16	10.79	9.42	9.12
Ohio	10.63	10.25	10.31	9.74	5.62	6.66	9.11	10.44	8.74	8.87
Wisconsin	12.22	11.72	9.75	9.21	6.38	6.63	--	--	9.33	9.17
West North Central	**8.6**	**8.68**	**7.26**	**7.14**	**5.54**	**5.7**	**6.19**	**6.12**	**7.26**	**7.32**
Iowa	9.47	9.62	7.46	7.21	4.94	4.94	--	--	7.03	7.01
Kansas	9.72	9.54	8.13	7.92	5.85	6.21	--	--	8.02	7.98
Minnesota	9.72	10.03	7.87	7.97	6.11	6.33	7.6	7.66	7.92	8.18
Missouri	7.65	7.85	6.45	6.3	4.65	4.98	4.78	4.67	6.6	6.73
Nebraska	7.9	7.7	7.29	7.02	6.39	6.45	--	--	7.24	7.1
North Dakota	7.29	6.89	6.55	6.51	6.07	5.85	--	--	6.68	6.49
South Dakota	8.22	7.92	7.04	6.83	5.82	5.73	--	--	7.33	7.12
South Atlantic	**10.71**	**11.08**	**9.38**	**9.79**	**6.28**	**6.62**	**10.35**	**11.51**	**9.45**	**9.82**
Delaware	13.16	13.67	11.3	12.3	8.87	9.91	--	--	11.64	12.37
District of Columbia	13.23	12.89	13.69	14.51	8.1	10.33	12.93	14.54	13.47	14.16
Florida	11.58	12.53	10.19	11.16	8.56	9.47	9.27	10.47	10.81	11.68
Georgia	9.64	9.69	9.15	8.83	5.75	5.8	6.95	6.41	8.57	8.47
Maryland	14.56	14.76	11.74	12.39	9.18	10.5	10.61	12.77	12.76	13.28
North Carolina	9.97	9.76	8.2	7.94	5.86	5.81	7.14	6.73	8.6	8.37
South Carolina	8.97	10.16	7.94	8.55	5.1	5.66	--	--	7.4	8.22
Virginia	10.21	10.25	7.68	8.3	6.62	6.96	8.37	8.66	8.59	8.97
West Virginia	8.41	7.72	7.54	6.92	5.74	5.31	9.1	8.52	7.27	6.68
East South Central	**8.92**	**9.68**	**8.84**	**9.5**	**5.19**	**5.85**	**9.9**	**10.74**	**7.48**	**8.19**
Alabama	10.33	10.49	10.16	9.92	5.26	5.9	--	--	8.36	8.68
Kentucky	7.57	8.34	6.77	7.85	4.53	4.75	--	--	5.84	6.41
Mississippi	9.38	10.25	9.38	9.8	5.71	6.84	--	--	8.15	8.98
Tennessee	8.54	9.76	9.05	10.17	6	7.26	9.9	10.74	7.98	9.19
West South Central	**10.8**	**11.59**	**9.26**	**9.32**	**6.25**	**6.9**	**17.16**	**9.76**	**8.95**	**9.39**
Arkansas	8.86	9.43	7.6	7.72	5.4	6	11.21	12.13	7.37	7.85
Louisiana	9.33	8.8	9.54	8.68	6.59	6.43	9.43	9.94	8.49	7.99
Oklahoma	8.51	8.37	6.65	6.36	4.43	4.57	--	--	6.79	6.6
Texas	11.88	13.18	9.76	10.1	6.58	7.51	18.31	9.72	9.63	10.37
Mountain	**9.9**	**9.49**	**8.38**	**8.14**	**5.74**	**5.65**	**8.23**	**7.68**	**8.09**	**7.85**
Arizona	10	9.94	8.69	8.72	6.15	6.09	--	--	8.73	8.72
Colorado	10.61	9.38	8.63	7.52	6.23	5.68	8.27	7.18	8.71	7.67
Idaho	7.79	7.3	6.72	6.12	4.75	4.29	--	--	6.55	6.09
Montana	8.78	8.67	8.3	8.32	5.71	5.62	--	--	7.59	7.48
Nevada	12.78	12.74	10.13	10.8	6.49	7.09	8.64	8.81	9.31	9.78
New Mexico	10.05	10.07	8.74	8.92	6.04	6.25	--	--	8.32	8.48
Utah	8.39	8.07	6.83	6.56	4.7	4.43	8.08	8.1	6.59	6.33
Wyoming	8.41	8.23	7.39	7.05	5.08	4.85	--	--	6.27	6.08
Pacific Contiguous	**12.25**	**11.43**	**11.1**	**10.86**	**7.51**	**7.12**	**8.31**	**8.04**	**10.77**	**10.35**
California	15.26	14.39	12.53	12.32	9.93	9.03	8.36	8.08	12.99	12.44
Oregon	8.81	8.46	7.84	7.86	6.04	5.09	6.96	6.84	7.85	7.52
Washington	7.78	7.6	7.35	7.15	4	4.47	6.02	6.09	6.62	6.77
Pacific Noncontiguous	**22.73**	**19.75**	**20.11**	**17.26**	**20.03**	**15.19**	**--**	**--**	**20.93**	**17.46**
Alaska	16.27	17.41	13.72	14.74	14.56	13.02	--	--	14.79	15.35
Hawaii	27.79	21.59	25.86	19.49	22.11	16	--	--	25.08	18.88
U.S. Total	**11.2**	**11.33**	**10.03**	**10.07**	**6.5**	**6.79**	**11.17**	**11.85**	**9.56**	**9.72**

[1] See Technical notes for additional information on the Commercial, Industrial, and Transportation sectors.

Notes: • See Glossary for definitions. • Values for 2009 and 2010 are preliminary estimates based on a cutoff model sample. See Technical Notes for a discuss

Source: U.S. Energy Information Administration, Form EIA-826, "Monthly Electric Sales and Revenue Report with State Distributions Report."

Back to Contents

Data 1: New York No 2 Distillate Residential Price by All Sellers (Cents per Gallon)

Sourcekey **D200112362**

Date	New York No 2 Distillate Residential Price by All Sellers (Cents per Gallon)	Yrs - By rah	Avg yrly inc %		
1978	50.1	1			
1979	71.2	2	21%		
1980	98.2	3	32%	Oil Embargo	
1981	123.2	4	36%		
1982	120.5	5	28%		
1983	112.1	6	21%		
1984	115.5	7	19%		
1985	111.3	8	15%		
1986	91.1	9	9%	1	
1987	85.2	10	7%	2	
1988	86.3	11	7%	3	
1989	95.8	12	8%	4	
1990	112.5	13	10%	5	
1991	111.3	14	9%	6	
1992	102.8	15	7%	7	
1993	100.1	16	6%	8	
1994	96.6	17	5%	9	
1995	95.5	18	5%	10	
1996	106.3	19	6%	11	
1997	106.5	20	6%	12	
1998	94.8	21	4%	13	
1999	96.9	22	4%	14	
2000	144.2	23	8%	15	
2001	136.3	24	7%	16	
2002	121.8	25	6%	17	
2003	143.6	26	7%	18	
2004	162.7	27	8%	19	
2005	210.5	28	11%		
2006	245.8	29	13%		
2007	267.4	30	14%	Recession begins	
2008	329.3	31	18%	The year I paid $4 plus for oil, these figures lack something, maybe delivery charges	
2009	250.3	32	12%		
2010 by rah	210.0	33	10%	$3.44 is what I paid for heating oil end of winter 2010, but I put in $2.50 to be hopelessly fair	

Assume best case scenario is we are entering a period of single digit growth, say 7.5% for min inc.
use 210 of price before worst of spike, as per previous cycles

Electric Power Annual 2008
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Table ES1. Summary Statistics for the United States, 1997 through 2008

Description	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Net Generation (thousand megawatthours)												
Coal[1]	1,985,801	2,016,456	1,990,511	2,012,873	1,978,301	1,973,737	1,933,130	1,903,956	1,966,265	1,881,087	1,873,516	1,845,016
Petroleum[2]	46,243	65,739	64,166	122,225	121,145	119,406	94,567	124,880	111,221	118,061	128,800	92,555
Natural Gas[3]	882,981	896,590	816,441	760,960	710,100	649,908	691,006	639,129	601,038	556,396	531,257	479,399
Other Gases[4]	11,707	13,453	14,177	13,464	15,252	15,600	11,463	9,039	13,955	14,126	13,492	13,351
Nuclear	806,208	806,425	787,219	781,986	788,528	763,733	780,064	768,826	753,893	728,254	673,702	628,644
Hydroelectric Conventional[5]	254,831	247,510	289,246	270,321	268,417	275,806	264,329	216,961	275,573	319,536	323,336	356,453
Other Renewables[6]	126,212	105,238	96,525	87,329	83,067	79,487	79,109	70,769	80,906	79,423	77,088	77,183
Wind	55,363	34,450	26,589	17,811	14,144	11,187	10,354	6,737	5,593	4,488	3,026	3,288
Solar Thermal and Photovoltaic	864	612	508	550	575	534	555	543	493	495	502	511
Wood and Wood Derived Fuels[7]	37,300	39,014	38,762	38,856	38,117	37,529	38,665	35,200	37,595	37,041	36,338	36,948
Geothermal	14,951	14,637	14,568	14,692	14,811	14,424	14,491	13,741	14,093	14,827	14,774	14,726
Other Biomass[8]	17,734	16,525	16,099	15,420	15,421	15,812	15,044	14,548	23,131	22,572	22,448	21,709
Pumped Storage[9]	-6,288	-6,896	-6,558	-6,558	-8,488	-8,535	-8,743	-8,823	-5,539	-6,097	-4,467	-4,040
Other[10]	11,692	12,231	12,974	12,821	14,232	14,045	13,527	11,906	4,794	4,024	3,571	3,612
All Energy Sources	**4,119,388**	**4,156,745**	**4,064,702**	**4,055,423**	**3,970,555**	**3,883,185**	**3,858,452**	**3,736,644**	**3,802,105**	**3,694,810**	**3,620,295**	**3,492,172**
Net Summer Generating Capacity (megawatts)												
Coal[1]	313,322	312,738	312,956	313,380	313,020	313,019	315,350	314,230	315,114	315,496	315,786	313,624
Petroleum[2]	57,445	56,068	58,097	58,548	59,119	60,730	59,651	66,162	61,837	60,069	66,282	72,463
Natural Gas[3]	397,432	392,876	388,294	383,061	371,011	355,442	312,512	252,832	219,590	195,119	180,288	176,471
Other Gases[4]	1,995	2,313	2,256	2,063	2,296	1,994	2,008	1,670	2,342	1,909	1,520	1,525
Nuclear	100,755	100,266	100,334	99,988	99,628	99,209	98,657	98,159	97,860	97,411	97,070	99,716
Hydroelectric Conventional[5]	77,930	77,885	77,821	77,541	77,641	78,694	79,356	78,916	79,359	79,393	79,151	79,415
Other Renewables[6]	38,493	30,069	24,113	21,205	18,717	18,153	16,710	16,101	15,572	15,942	15,444	15,351
Wind	24,651	16,515	11,329	8,706	6,456	5,995	4,417	3,864	2,377	2,252	1,720	1,610
Solar Thermal and Photovoltaic	536	502	411	411	398	397	397	392	386	389	335	334
Wood and Wood Derived Fuels[7]	6,864	6,704	6,372	6,193	6,182	5,871	5,844	5,882	6,147	6,795	6,802	6,924
Geothermal	2,256	2,214	2,274	2,285	2,152	2,133	2,252	2,216	2,793	2,846	2,893	2,893
Other Biomass[11]	4,186	4,134	3,727	3,609	3,529	3,758	3,800	3,748	3,869	3,660	3,694	3,590
Pumped Storage[9]	21,858	21,886	21,461	21,347	20,764	20,522	20,371	19,664	19,522	19,565	19,518	19,310
Other[12]	942	788	882	887	746	684	686	519	523	1,023	810	774
All Energy Sources	**1,010,171**	**994,888**	**986,215**	**978,020**	**962,942**	**948,446**	**905,301**	**848,254**	**811,719**	**785,927**	**775,868**	**778,649**
Demand, Capacity Resources, and Capacity Margins – Summer												
Net Internal Demand (megawatts)	744,151	766,786[R]	776,479[R]	746,470	692,908	696,752	696,376	674,833	680,941	653,857	638,086	618,389

Capacity Resources (megawatts)	956,581	914,397[R]	891,226[R]	882,125	875,870	856,131	833,380	788,990	808,054	765,744	744,670	737,855
Capacity Margins (percent)	22.2	16.1[R]	12.9[R]	15.4	20.9	18.6	16.4	14.5	15.7	14.6	14.3	16.2
Fuel												
Consumption of Fossil Fuels for Electricity Generation												
Coal (thousand tons)[1]	1,042,335	1,046,795	1,030,556	1,041,448	1,020,523	1,014,058	987,583	972,691	994,933	949,802	946,295	931,949
Petroleum (thousand barrels)[2]	80,932	112,615	110,634	206,785	203,494	206,653	168,597	216,672	195,228	207,871	222,640	159,715
Natural Gas (millions of cubic feet)[3]	6,895,843	7,089,342	6,461,615	6,036,370	5,674,580	5,616,135	6,126,062	5,832,305	5,691,481	5,321,984	5,081,384	4,564,770
Other Gases (millions of Btu)[4]	96,757	114,904	114,665	109,916	135,144	156,306	131,230	97,308	125,971	126,387	124,988	119,412
Consumption of Fossil Fuels for Thermal Output in Combined Heat and Power Facilities												
Coal (thousand tons)[1]	22,168	22,810	23,227	23,833	24,275	17,720	17,561	18,944	20,466	20,373	20,320	21,005
Petroleum (thousand barrels)[2]	12,016	19,775	20,371	24,408	25,870	17,939	14,811	18,268	22,266	26,822	28,845	28,802
Natural Gas (millions of cubic feet)[3]	793,537	872,579	942,817	984,340	1,052,100	721,267	860,019	898,286	985,263	982,958	949,106	868,569
Other Gases (millions of Btu)[4]	203,236	214,321	226,464	238,396	218,295	137,837	146,882	166,161	230,082	223,713	208,828	187,680
Consumption of Fossil Fuels for Electricity Generation and Useful Thermal Output												
Coal (thousand tons)[1]	1,064,503	1,069,606	1,053,783	1,065,281	1,044,798	1,031,778	1,005,144	991,635	1,015,398	970,175	966,615	952,955
Petroleum (thousand barrels)[2]	92,948	132,389	131,005	231,193	229,364	224,593	183,408	234,940	217,494	234,694	251,486	188,517
Natural Gas (millions of cubic feet)[3]	7,689,380	7,961,922	7,404,432	7,020,709	6,726,679	6,337,402	6,986,081	6,730,591	6,676,744	6,304,942	6,030,490	5,433,338
Other Gases (millions of Btu)[4]	299,993	329,225	341,129	348,312	353,438	294,143	278,111	263,469	356,053	350,100	333,816	307,092
Stocks at Electric Power Sector Facilities (year end)												
Coal (thousand tons)[13]	161,589	151,221	140,964	101,137	106,669	121,567	141,714	138,496	102,296	141,604	120,501	98,826
Petroleum (thousand barrels)[14]	44,498	47,203	51,583	50,062	51,434	53,170	52,490	57,031	40,932	54,109	56,591	51,138
Receipts of Fuel at Electricity Generators[15]												
Coal (thousand tons)[1]	1,069,709	1,054,664	1,079,943	1,021,437	1,002,032	986,026	884,287	762,815	790,274	908,232	929,448	880,588
Petroleum (thousand barrels)[2]	96,341	88,347	100,965	194,733	186,655	185,567	120,851	124,618	108,272	145,939	181,276	128,749
Natural Gas (millions of cubic feet)[16]	7,879,046	7,200,316	6,675,246	6,181,717	5,734,054	5,500,704	5,607,737	2,148,924	2,629,986	2,809,455	2,922,957	2,764,734
Cost of Fuel at Electricity Generators (cents per million Btu)[15]												
Coal[1]	207	177	169	154	136	128	125	123	120	122	125	127
Petroleum[2]	1,087	717	623	644	429	433	334	369	418	236	202	273
Natural Gas[16]	902	711	694	821	596	539	356	449	430	257	238	276

Emissions (thousand metric tons)												
Carbon Dioxide (CO_2)	2,477,213	2,539,805[R]	2,481,829[R]	2,536,675[R]	2,479,971[R]	2,438,338[R]	2,417,327[R]	2,412,030[R]	2,464,550[R]	2,360,424[R]	2,345,951[R]	2,253,783[R]
Sulfur Dioxide (SO2)[17]	7,830	9,042	9,524	10,340	10,309	10,646	10,881	11,174	11,963	12,843	13,464	13,480
Nitrogen Oxides (NO_X)[17]	3,330	3,650	3,799	3,961	4,143	4,532	5,194	5,290	5,638	5,955	6,459	6,500
Trade (million megawatthours)												
Purchases	5,613	5,411	5,503	6,092	6,999	6,980	8,755	7,555	2,346	2,040	2,021	1,966
Sales for Resale	5,681	5,479	5,493	6,072	6,759	6,921	8,569	7,345	2,355	1,998	1,922	1,839
Electricity Imports and Exports (thousand megawatthours)												
Imports	57,021	51,396	42,691	44,527	34,210	30,395	36,779	38,500	48,592	43,215	39,513	43,031
Exports	24,083	20,144	24,271	19,791	22,898	23,975	15,796	16,473	14,829	14,222	13,656	8,974

See end of table for Notes and Sources.

Table ES1. Summary Statistics for the United States, 1997 through 2008

(Continued)

Description	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997
Retail Sales and Revenue Data – Bundled and Unbundled												
Number of Ultimate Customers (thousands)												
Residential	124,937	123,950	122,471	120,761	118,764	117,280	116,622	114,890	111,718	110,383	109,048	107,066
Commercial	17,563	17,377	17,172	16,872	16,607	16,550	15,334	14,867	14,349	14,074	13,887	13,542
Industrial	775	794	760	734	748	713	602	571	527	553	540	563
Transportation	1	1	1	1	1	1	NA	NA	NA	NA	NA	NA
Other	NA	NA	NA	NA	NA	NA	1,067	1,030	974	935	933	952
All Sectors	143,276	142,122	140,404	138,367	136,119	134,544	133,624	131,359	127,568	125,945	124,408	122,123
Sales to Ultimate Customers (thousand megawatthours)												
Residential	1,379,981	1,392,241	1,351,520	1,359,227	1,291,982	1,275,824	1,265,180	1,201,607	1,192,446	1,144,923	1,130,109	1,075,880
Commercial	1,335,981	1,336,315	1,299,744	1,275,079	1,230,425	1,198,728	1,104,497	1,083,069	1,055,232	1,001,996	979,401	928,633
Industrial	1,009,300	1,027,832	1,011,298	1,019,156	1,017,850	1,012,373	990,238	996,609	1,064,239	1,058,217	1,051,203	1,038,197
Transportation	7,700	8,173	7,358	7,506	7,224	6,810	NA	NA	NA	NA	NA	NA
Other	NA	NA	NA	NA	NA	NA	105,552	113,174	109,496	106,952	103,518	102,901
All Sectors	3,732,962	3,764,561	3,669,919	3,660,969	3,547,479	3,493,734	3,465,466	3,394,458	3,421,414	3,312,087	3,264,231	3,145,610
Direct Use	173,481	159,254	146,927	150,016	168,470	168,295	166,184	162,649	170,943	171,629	160,866	156,239
Total Disposition	3,906,443	3,923,814	3,816,845	3,810,984	3,715,949	3,662,029	3,631,650	3,557,107	3,592,357	3,483,716	3,425,097	3,301,849
Revenue From Ultimate Customers (million dollars)												
Residential	155,433	148,295	140,582	128,393	115,577	111,249	106,834	103,158	98,209	93,483	93,360	90,704
Commercial	138,469	128,903	122,914	110,522	100,546	96,263	87,117	85,741	78,405	72,771	72,575	70,497
Industrial	68,920	65,712	62,308	58,445	53,477	51,741	48,336	50,293	49,369	46,846	47,050	47,023
Transportation	827	792	702	643	519	514	NA	NA	NA	NA	NA	NA

Other	NA	NA	NA	NA	NA	NA	7,124	8,151	7,179	6,796	6,863	7,110
All Sectors	363,650	343,703	326,506	298,003	270,119	259,767	249,411	247,343	233,163	219,896	219,848	215,334
Description	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**
Average Retail Price (cents per kilowatthour)												
Residential	11.26	10.65	10.4	9.45	8.95	8.72	8.44	8.58	8.24	8.16	8.26	8.43
Commercial	10.36	9.65	9.46	8.67	8.17	8.03	7.89	7.92	7.43	7.26	7.41	7.59
Industrial	6.83	6.39	6.16	5.73	5.25	5.11	4.88	5.05	4.64	4.43	4.48	4.53
Transportation	10.74	9.7	9.54	8.57	7.18	7.54	NA	NA	NA	NA	NA	NA
Other	NA	NA	NA	NA	NA	NA	6.75	7.2	6.56	6.35	6.63	6.91
All Sectors	9.74	9.13	8.9	8.14	7.61	7.44	7.2	7.29	6.81	6.64	6.74	6.85
Revenue and Expense Statistics (million dollars)												
Major Investor Owned												
Utility Operating Revenues	298,962	278,499[R]	275,501[R]	265,652[R]	238,759[R]	230,151[R]	219,609[R]	267,276[R]	233,915[R]	213,090[R]	214,849[R]	209,022[R]
Utility Operating Expenses	267,263	248,039[R]	245,589[R]	236,786[R]	206,960[R]	201,057[R]	189,062[R]	234,910[R]	210,250[R]	180,467[R]	183,954[R]	177,798[R]
Net Utility Operating Income	31,699	30,460[R]	29,912[R]	28,866[R]	31,799[R]	29,094[R]	30,548[R]	32,366[R]	23,665[R]	32,623[R]	30,896[R]	31,225[R]
Major Publicly Owned (with Generation Facilities)												
Operating Revenues	NA	NA	NA	NA	NA	33,906	32,776	38,028	31,843	26,767	26,155	25,397
Operating Expenses	NA	NA	NA	NA	NA	29,637	28,638	32,789	26,244	21,274	20,880	20,425
Net Electric Operating Income	NA	NA	NA	NA	NA	4,268	4,138	5,238	5,598	5,493	5,275	4,972
Major Publicly Owned (without Generation Facilities)												
Operating Revenues	NA	NA	NA	NA	NA	12,454	11,546	10,417	9,904	9,354	8,790	8,586
Operating Expenses	NA	NA	NA	NA	NA	11,481	10,703	9,820	9,355	8,737	8,245	8,033
Net Electric Operating Income	NA	NA	NA	NA	NA	974	843	597	549	617	545	552
Major Federally Owned												
Operating Revenues	NA	NA	NA	NA	NA	11,798	11,470	12,458	10,685	10,186	9,780	8,833
Operating Expenses	NA	NA	NA	NA	NA	8,763	8,665	10,013	8,139	7,775	7,099	5,999
Net Electric Operating Income	NA	NA	NA	NA	NA	3,035	2,805	2,445	2,546	2,411	2,681	2,834
Major Cooperative Borrower Owned												
Operating Revenues	42,076	38,208	36,723	34,088	30,650	29,228	27,458	26,458	25,629	23,824	23,988	23,321
Operating Expenses	38,498	34,843	33,550	31,209	27,828	26,361	24,561	23,763	22,982	21,283	21,223	20,715
Net Electric Operating Income	3,578	3,365	3,173	2,879	2,822	2,867	2,897	2,696	2,647	2,541	2,764	2,606
Demand-Side Management (DSM) Data[18]												
Actual Peak Load Reductions (megawatts)												
Total Actual Peak Load Reduction	32,741	30,253[R]	27,240	25,710	23,532	22,904	22,936	24,955	22,901	26,455	27,231	25,284
DSM Energy Savings (thousand megawatthours)												

Energy Efficiency	86,001	67,134	62,951	58,891	52,662	48,245	52,285	52,946	52,827	49,691	48,775	55,453
Load Management	1,824	1,857[R]	865	1,006	2,047	2,020	1,790	990	875	872	392	953
DSM Cost (million dollars)												
Total Cost	3,720	2,523[R]	2,051	1,921	1,557	1,297	1,626	1,630	1,565	1,424	1,421	1,636

[1] Includes anthracite, bituminous, subbituminous and lignite coal. Waste and synthetic coal are included starting in 2002.
[2] Distillate fuel oil (all diesel and No. 1, No. 2, and No. 4 fuel oils), residual fuel oil (No. 5 and No. 6 fuel oils and bunker C fuel oil), jet fuel, kerosene, petroleum coke (converted to liquid pet
[3] Includes a small number of generators for which waste heat is the primary energy source.
[4] Blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.
[5] Conventional hydroelectric power excluding pumped storage facilities.
[6] Other renewables represents the summation of the sub-categories of Wind, Solar Thermal and Photovoltaic, Wood and Wood Derived Fuels, Geothermal, and Other Biomass.
[7] Wood/wood waste solids (including paper pellets, railroad ties, utility poles, wood chips, bark, and wood waste solids), wood waste liquids (red liquor, sludge wood, spent sulfite liquor, an
[8] Biogenic municipal solid waste, landfill gas, sludge waste, agricultural byproducts, other biomass solids, other biomass liquids, and other biomass gases (including digester gases, methar
[9] Pumped storage is the capacity to generate electricity from water previously pumped to an elevated reservoir and then released through a conduit to turbine generators located at a lower
[10] Non-biogenic municipal solid waste, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels and miscellaneous technologies.
[11] Municipal solid waste, landfill gas, sludge waste, agricultural byproducts, other biomass solids, other biomass liquids, and other biomass gases (including digester gases, methane, and c
[12] Batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels and miscellaneous technologies.
[13] Anthracite, bituminous, subbituminous, lignite, and synthetic coal; excludes waste coal.
[14] Distillate fuel oil (all diesel and No. 1, No. 2, and No. 4 fuel oils), residual fuel oil (No. 5 and No. 6 fuel oils and bunker C fuel oil), jet fuel, kerosene, petroleum coke (converted to liquid pe
[15] For 2002 through 2007, includes data from the Form EIA-423 for independent power producers, and commercial and industrial power-producing facilities. Beginning in 2008, data are collected on the Form EIA-923 for utilities, independent power producers, and commercial and industrial power-producing facilities. Receipts, cost, and quality data are collected from plants above a 50 MW threshold, and imputed for plants between 1 and 50 MW. Therefore, there may be a notable increase in fuel receipts beginning with 2008 data.
[16] Natural gas, including a small amount of supplemental gaseous fuels that cannot be identified separately.
[17] SO2 and NOx 2008 values are preliminary.
[18] Data presented are reflective of large utilities.
NA = Not available.
R = Revised.
Note: ·See Glossary reference for definitions.·See Technical Notes Table A5 for conversion to different units of measure.·Capacity by energy source is based on the capacity associated v
Sources: U.S. Energy Information Administration Form EIA-411, "Coordinated Bulk Power Supply Program Report;" Form EIA-412, "Annual Electric Industry Financial Report" The Form E